BLUE JAY

June 1983

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Funds for this color cover were kindly donated by Frank Brazier.

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BIG GULLY CREEK SANCTUARY — A memorial to those who worked to protect it.

There are several unique features near where Big Gully Creek empties into the North Saskatchewan River that make this area one that has drawn local lovers of nature from "pioneer" days (perhaps even before then) to the present. The Pikes who emigrated from England were among those who brought their families to the area on special outings. In the early fifties local people tried to have the area protected without success. Gatherings of several different kinds have taken place there as well as Boy Scout and Girl Guide outings and individual visits.

Besides the junction of the creek and river which attracts many as a fishing spot the area is one of exceptional beauty where parkland and forest meet. In an area of sandhills and scrub poplars (Trembling Aspen) the creek and river support White Spruce and birch, and alder and Highbush Cranberry along their banks. One loop of the creek, locally known as The Horseshoe, has spruce, cactus and creeping juniper on its steep south-facing bank and springs near the base of the east-facing slope. In the moss of these springs grow plants unusual in the area, including Common Butterwort, Blue Columbine, Sparrow's-egg Ladies' Slippers and bog orchids. The Swamps are outliers of the north. Tamarack and Glandular Birch are not found elsewhere in the area. There is much of interest to both plant and bird lovers as Pileated and Three-toed Woodpeckers, Turkey Vultures and Great-crested Flycatcher occur there. Pine Island which lies in the river opposite the mouth of the creek was the site of five fur-trading posts and is protected as an archaeological site.

Changes have occurred in the last decade. The quarter containing the Horseshoe is no longer Crown owned. The new owner unfortunately has destroyed much of the aspen that covered it in favor of cropping what was formerly mostly pasture. Naturally, free access for those who love the area is now questioned. In 1970, when the quarter on which the mouth of Big Gully Creek is situated was being considered as an I.B.P. (International Biological Program) area, the lessee, without permission of the municipal council, brushed trails on some of the creek bank and used a breaking plow on some of the grassland. This damage is slowly but surely repairing itself. The swamp nearest the mouth remains under the protection of a descendant of Frank Foster who homesteaded the area in 1902 and whose grave is on the land. He loved the area and tried to protect it in his lifetime.

While the destruction can never be completely erased it served to spur the interested local residents to fight to save the land as a natural area. Since May 1971 the 600 acres at the mouth of the creek has been leased by the Saskatchewan Natural History Society, with local people donating much of the funds to pay the rent.[1] Winifred and Christine Pike carried the burden of making sure that the funds were adequate each year. In addition many of the local residents spent time each year checking the area, cleaning up after vandals and the careless, and trying to enforce the no hunting signs. Two of the stoutest supporters are no longer with us. Margaret Hickson (nee Pike) spent time picking up smashed beer bottles when she

could have been enjoying the area. Ozzie Beamish flew his plane over every so often to check on the area. Vandalism, which reached its peak during the oil boom, has now virtually vanished.

On 25 March 1983 a very well attended ratepayers' meeting of the R.M. of Paynton voted to sell the land to the Wildlife Development Fund, to be protected as a sanctuary. Those present were thrilled with a twelve minute audio-visual presentation put together by local photographers, including Vernon Schrank, Velma Foster, Hans de Vogel, and Jim Metherell, working with Christine Pike and David Goodwillie. Donations of the S.N.H.S. and individuals to the Wildlife Development Fund will help to cover the cost of the land purchase.

This is an historic event and the present council of the R.M. of Paynton is to be highly commended for their sincerity, foresight and co-operation. It is to be hoped that arrangements can be worked out so that the Rural Municipality and the Society hold caveats to the title, whereby insuring that local people have input to the protection of this beautiful part of Saskatchewan.

[1] PIKE, CHRISTINE. 1972. A conservation project on Big Gully Creek. Blue Jay 30(1): 6-7.

— *S. M. Lamont*

Common Butterwort. *Wayne Lynch*

COLOR VARIATION IN WESTERN RED LILY

BRIAN IRVING, Box 727, Kelvington, Saskatchewan. S0A 1W0

Yellow-flowered Western Red Lily. *Brian Irving*

During the summer of 1982, there were unusually abundant and brilliant displays of our floral emblem, the Western Red Lily (*Lilium philadelphicum* var. *andinum*), in the parklands of Saskatchewan.

An exciting discovery for me was to find yellow flowered lilies at two sites on our farm. We often see lilies with flowers of various shades of red, pink, or orange, but these were definitely yellow. The habitat at both sites was native, slightly saline meadow which has a history of being good lily country.

The first plant was discovered 4 July 1982. At that time it had two open flowers and one bud which later opened. These flowers were entirely yellow without the dark spots which are typical of the Western Red Lily. Even the pollen was yellow.

Shortly after this find, a second location was discovered about a mile from the first, which eventually produced six yellow-flowering plants within a radius of about fifteen metres. This site was visited by Jim and Shirley Jowsey on 15 July 1982.

Yellow-flowered lily. *Brian Irving*

Normal colored Western Red Lily. *J. B. Gollop*

The plants here exhibited considerable variation in color pattern. Two plants each produced a single yellow flower with faint, greyish spots. One plant had a single orangish-yellow flower with red spots, and brown anthers and stigma. Two more plants each had two flowers, all yellow with no spotting. The other lily produced a single deep yellow flower with brown anthers and stigma.

There were some characteristics which these yellow-flowered plants had in common. They appeared more vigorous and were 5 to 10 cm taller, with thicker stems, than the red flowered plants growing next to them. The foliage was extremely smooth and a pale green, while the ribs of the stem, usually brownish, were a dark shade of green. The entire plants exhibited atypical coloration.

According to Scoggan yellow-flowering lilies have been identified as *Lilium philadelphicum L.* var. *andinum* (Nutt) Ker. forma *immaculata* Raup.[2] He describes them as "flowers lemon-yellow, devoid of the usual dark spots; (known from the type locality, Jenkins Lake, Alberta)". Boivin also mentions forma *immaculata* as having "flowers yellow and spotless or the spots rather weak" and he indicates specimens have been found in Manitoba, Saskatchewan, and Alberta.[1] Scoggan also mentions a yellow form of the eastern variety *Lilium philadelphicum* L. var. *philadelphicum* forma *flaviforum* Williams. He indicates this form was observed near Moosehorn, Manitoba.[2]

It seems that these yellow color variations do occur periodically but certainly not frequently nor are they widespread. It would be most interesting if anyone having observed these yellow lilies in natural habitat would report their sightings to the *Blue Jay* or to myself.

Acknowledgements

I would like to thank Jim and Shirley Jowsey for coming to verify my siting and for their support in the preparation of this article. I also want to thank J. H. Hudson for his personal correspondence and for referring me to the texts mentioned.

[1] BOIVIN, BERNARD 1967, Flora of the Prairie Provinces, Part IV, Herbier Louis-Marie, Universite Laval and Department of Agriculture, Ottawa.

[2] SCOGGAN, H. J. 1978, The Flora of Canada, Part Two, National Museums of Canada, Ottawa.

SKIPPERS AND BUTTERFLIES OF THE INDIAN GRAVE CAMPGROUND AREA, ALBERTA

HAROLD W. PINEL, 1017 - 19 Ave. N.W., Calgary, Alberta. T2M 0Z8

The study area is situated south of Indian Grave Campground in the Bow Crow Forest in the foothills of the Rocky Mountains approximately 75 kilometres south-southwest of Calgary on secondary road 532. The main campground lies along Johnson Creek in open aspen - White Spruce woods and the overflow campground to the northwest is on a ridge dominated by Lodgepole Pine.

The area of approximately 125 hectares is situated in parts of 9-15-3-W5 and 4-15-3-W5 with elevations varying from 1468 m to 1528 m, bounded on the north by the campgrounds, on the east by a major north-south cut line, on the west by an old four-wheel drive road heading south from the actual Indian graves, and on the south by an arbitrary line, approximately 2500 m south of the campground. About 8 kilometres west of the study area (via No. 532) are the east slopes of the Livingstone Range.

Within the small study area, there is a variety of treed, grassy, and aquatic habitats. The treed habitats vary with the moisture regimes from Lodgepole Pine forests on the drier exposed ridges to aspen and some White Spruce in intermediate moisture regimes to Balsam Poplar and White Spruce along the creeks and other low-lying wet areas. The open areas consist of disturbed grasslands in the campgrounds, along the roadways, and along the cut line; and small pockets of native grasslands on the hillsides. Characteristic herbs of these grasslands include Nodding Onion, White Camas, Three-flowered Avens, Perennial Lupine, Graceful Cinquefoil, White Cinquefoil, Common Bluebell, Northern Bedstraw, False Dandelion, Wild Gaillardia, and Silvery Groundsel. Aquatic habitats in the study area consist of the creeks and a few low-lying wet areas. The low-lying wet areas (shrub fens) are grassy with numerous willows and Swamp Birch interspersed.

Annotated List

The following list is the result of field observations and collections made by the author on 19 different days over a period of 8 years from 1975 - 1982, with a seasonal spread from 21 May to 1 October. Most of the field time was between the end of May and the end of August. Dates indicating days for which specimen records are available are written in an abbreviated formăt (e.g. 31/5/80 means 31 May 1980). Also included are some sightings and collections made by Norbert Kondla. These are acknowledged by "NK" following the date. Most of the common names are from Hooper.[4] Scientific names generally follow Howe for genus, and Miller and Brown for species and subspecies.[5 7]

Hesperiidae — Skippers

DRACO SKIPPER (*Polites draco*) — Occasional in meadows along the creeks; 10/7/77 NK, 5/7/80.

GARITA SKIPPER (*Oarisma garita*) — Fairly common in meadows and along the cut line; 10/7/77 NK, 5/7/80, 26/7/80, 26/7/80 NK, 11/7/82; prefers native grasslands.

DREAMY DUSKY WING (*Erynnis icelus*) — One specimen was collected on

11/7/82 in a small pocket of native grassland bordered by Aspen woods.

PERSIUS DUSKY WING (*Erynnis persius*) — Uncommon in grassy areas; 10/7/82, 11/7/82; prefers small pockets of native grasslands.

AFRANIUS DUSKY WING (*Erynnis afranius*) — Uncommon, but more numerous than the preceding species, in grasslands; 31/5/80, 11/7/82.

Papilionidae — Parnassians and Swallowtails

CLOUDED PARNASSIAN (*Parnassius phoebus smintheus*) — Individual was observed by Kondla and Pinel on 26/7/80 flying through the Indian Grave Campground. This species occurs in the study area as a stray from the Livingstone Range.

ZELICAON SWALLOWTAIL (*Papilio zelicaon nitra*) — Collected once on 22/5/82 on a south-facing grassy slope.

TIGER SWALLOWTAIL (*Papilio glaucus canadensis*) — Common near poplar woods; flight records from 31 May to 19 July; white forms of females are common especially during the last half of the flight period; 19/7/75, 31/5/80, 8/6/80, 5/7/80, 10/7/80, 11/7/82.

Tiger Swallowtails. *W. S. Richards*

Pieridae — Whites and Sulphurs

WESTERN CHECKERED WHITE (*Pieris occidentalis occidentalis*) — Fairly common in disturbed meadows and along cut line; 20/7/75, 23/8/81, 11/7/82.

MUSTARD WHITE (*Pieris napi*) — Occasional along cut line in Lodgepole Pine woods; 31/5/80, 10/7/82, 11/7/82.

CABBAGE WHITE (*Pieris rapae*) — Fairly common in disturbed areas such as the campgrounds and along roadways; flight records from 21 May to 27 August; 27/8/75, 15/8/81, 23/8/81, 21/5/82, 22/5/82, 23/5/82, 24/5/82.

ORANGE ALFALFA BUTTERFLY (*Colias eurytheme eurytheme*) — One male was collected on 23/8/81 in disturbed grasslands.

YELLOW ALFALFA BUTTERFLY (*Colias philodice eriphyle*) — Common in disturbed grasslands, in campgrounds, and along the roadways and cut line; flight records from 31 May to 23 August; 5/8/79, 31/5/80, 8/6/80, 15/8/81, 23/8/81, 10/7/82, 11/7/82.

PINK-EDGED SULPHUR (*Colias interior interior*) — Fairly common in pine woods during July and early August; 5/8/79, 5/7/80, 26/7/80, 9/8/80, 15/8/81, 10/7/82, 11/7/82.

ALEXANDRA SULPHUR (*Colias alexandra astraea*) — Occasional along cut line and in rocky meadows; 19/7/75.

Alexandra Sulphur. *C. R. Wershler*

CREUSA MARBLE (*Euchloe creusa*) — Rare straggler to the study area from the Livingstone Range; 26/7/78 NK.

LARGE MARBLE (*Euchloe ausonides*) — Scarce and local in a disturbed grassy meadow near a garbage dump along the cut line; 31/5/80.

Lycaenidae — Gossamer-winged Butterflies

HOARY ELFIN (*Callophrys polios obscurus*) — Collected once in pine woods; 31/5/80.

WESTERN PINE ELFIN (*Callophrys eryphon eryphon*) — Occasional in pine woods: 22/5/82.

MARIPOSA COPPER (*Epidemia mariposa penroseae*) — Occasional along the cut line in pine woods; 19/7/75, 20/7/75, 26/7/80.

PURPLISH COPPER (*Epidemia helloides*) — Collected once in a low wet area along the cut line; 20/7/75.

SCUDDER'S BLUE (*Lycaeides argyrognomon scudderii*) — Occasional in grassy meadows bordered by Lodgepole Pine and aspen; 20/7/75, 10/7/77 NK.

GREENISH BLUE (*Plebejus saepiolus amica*) — Common in grasslands and along the cut line; 19/7/75, 10/7/77 NK, 5/8/79, 5/7/80, 11/7/82.

PEMBINA BLUE (*Plebejus icarioides pembina*) — Common, but local, in native grasslands bordered by aspen woods; 20/7/75, 5/7/80, 10/7/82, 11/7/82.

ARCTIC BLUE (*Plebejus franklinii megalo*) — Scarce in meadows; 20/7/75.

WESTERN TAILED BLUE (*Everes amyntula albrighti*) — Common in aspen woods, native grasslands, and mixed poplar-spruce woods; flight recorded from 31 May to 19 July; 19/7/75, 31/5/80, 8/6/80, 10/7/82, 11/7/82.

SILVERY BLUE (*Glaucopsyche lygdamus couperi*) — Common in aspen woods, grasslands and along cut line; flight period recorded from 21 May to 20 July; 20/7/75, 31/5/80, 8/6/80, 21/5/82, 22/5/82, 23/5/82, 24/5/82, 10/7/82, 11/7/82; occasional during August; 15/8/81.

Nymphalidae — Brush-footed Butterflies

WHITE ADMIRAL (*Basilarchia arthemis rubrofasciata*) — Fairly common in poplar woods; recorded flying from 5 July to 23 August; 19/7/75, 5/8/79, 5/7/80, 26/7/80, 26/7/80 NK, 15/8/81, 23/8/81, 10/7/82.

RED ADMIRAL (*Vanessa atalanta rubria*) — Occasional in disturbed grasslands; 15/8/81.

PAINTED LADY (*Vanessa cardui*) — Collected once on 5/8/79 in a roadside ditch.

MILBERT'S TORTOISE-SHELL (*Nymphalis milberti furcillata*) — Common in poplar woods and along the cut line; recorded flight period from 21 May to 1 October; 19/7/75, 20/7/75, 5/8/79, 8/8/80, 9/8/80, 10/8/80, 21/5/82, 22/5/82, 23/5/82, 24/5/82, 10/7/82, 11/7/82.

Greenish Blue. *C. R. Wershler*

Milbert's Tortoise-shell. *R. W. Knapton*

MOURNING CLOAK (*Nymphalis antiopa antiopa*) — Fairly common in poplar woods; appear to be most common during last half of May; 31/5/80, 1/10/80, 15/8/81, 21/5/82, 22/5/82, 23/5/82, 24/5/82.

SATYR ANGLE WING (*Polygonia satyrus*) — Uncommon in poplar woods; 31/5/80, 8/6/80, 8/8/80, 9/8/80, 10/8/80.

GREEN COMMA (*Polygonia faunus rusticus*) — Common in wooded areas; flight period recorded from 21 May to 1 October; 31/5/80, 8/6/80, 26/7/80, 8/8/80, 9/8/80, 10/8/80, 1/10/80, 21/5/82, 22/5/82, 23/5/82, 24/5/82, 11/7/82.

GRAY COMMA (*Polygonia progne*) — Collected once on 8/6/80 at the edge of aspen woods.

ROCKY MOUNTAIN CHECKERSPOT (*Chlosyne palla calydon*) — Occasional and local in pockets of native grasslands surrounded by forests; 20/7/75, 10/7/82.

PEARL CRESCENT (*Phyciodes tharos*) — Fairly common in meadows, poplar woods, and along the cut line during July, 20/7/75, 5/7/80, 26/7/80, 10/7/82, 11/7/82.

MEADOW CRESCENT (*Phyciodes pratensis*) — Fairly common in meadows, poplar woods, and along the cut line during July, 20/7/75, 5/7/80, 26/7/80, 10/7/82, 11/7/82.

Pearl Crescent. *Gary Anweiler*

HEWITSON'S CHECKERSPOT (*Euphydryas anicia anicia*) — Uncommon in patches of native grassland and along the cut line during July; 5/7/80, 10/7/82, 11/7/82.

GILLETTE'S CHECKERSPOT (*Euphydryas gillettii*) — Scarce; collected at the edge of a low-lying wet area bordered by mixed woods; 19/7/75, 10/7/82.

SILVER-BORDERED FRITILLARY (*Boloria selene*) — Small localized population in a wet area dominated by willows and Swamp Birch; 10/7/77 NK, 26/7/80.

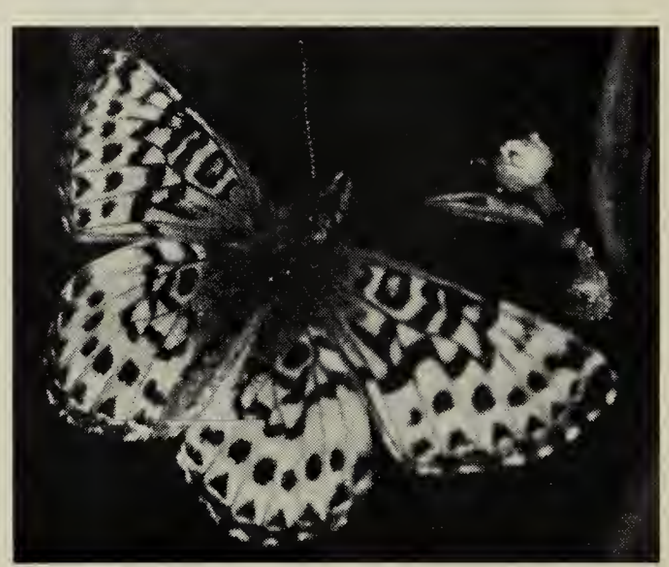
MEADOW FRITILLARY (*Boloria bellona jenistai*) — Uncommon in grasslands and along the cut line; 31/5/80, 8/6/80, 10/7/82, 11/7/82.

FRIGGA FRITILLARY (*Boloria frigga saga*) — Scarce in a low lying wet area dominated by grasses and willows; 31/5/80.

WESTERN MEADOW FRITILLARY (*Boloria epithore borealis*) — Collected once on 10/7/82 flying along the cut line.

FREIJA FRITILLARY (*Boloria freija freija*) — Common in open grassy areas among Lodgepole Pine and White Spruce from mid-May to mid-June; 31/5/80, 8/6/80, 21/5/82, 22/5/82, 23/5/82, 24/5/82.

PURPLE LESSER FRITILLARY (*Boloria titania*) — Common in coniferous woods, mixed woods, and open areas adjacent woods; flight period recorded from 5 July to 23 August; 5/8/79, 5/7/80, 26/7/80, 26/7/80 NK, 8/8/80, 9/8/80, 10/8/80, 15/8/81, 23/8/81.



Purple Lesser Fritillary. *Fred Lahrman*

EDWARD'S FRITILLARY (*Speyeria edwardsii*) — Occasional in mixed woods from mid-July to mid-August; 19/7/75, 26/7/80, 8/8/80, 9/8/80, 10/8/80, 15/8/81.

ZERENE FRITILLARY (*Speyeria zerene garretti*) — Fairly common in Lodgepole Pine woods, mixed woods, and in native grasslands bordered by mixed woods; flight period recorded from 5 July to 23 August; 5/8/79, 5/7/80, 15/8/81, 23/8/81, 10/7/82, 11/7/82.

CALLIPPE FRITILLARY (*Speyeria callippe calgariana*) — Collected once along the cut line; 5/7/80.

BEAN'S FRITILLARY (*Speyeria atlantis beani*) — Common in Lodgepole Pine woods, mixed woods, and grassy meadows during July and August; 19/7/75, 20/7/75, 10/7/77 NK, 12/7/77 NK, 5/8/79, 5/7/80, 26/7/80, 26/7/80 NK, 8/8/80, 9/8/80, 10/8/80, 15/8/81, 23/8/81, 10/7/82, 11/7/82.

MORMON FRITILLARY (*Speyeria mormonia*) — Common in grasslands, along the cut line, and in open woods from mid-July to the end of August; 20/7/75, 5/8/79, 18/7/80 NK, 26/7/80, 8/8/80, 9/8/80, 10/8/80, 15/8/81, 23/8/81.

APHRODITE (*Speyeria aphrodite*) Collected once by Kondla along the cut line on 26/7/80.

Satyridae — Nymphs, Satyrs and Arctics

RINGLET (*Coenonympha inornata benjamini*) — Uncommon in grasslands and disturbed areas along roadways; 11/7/77 NK, 18/7/80, 15/8/81, 10/7/82, 11/7/82.

COMMON WOOD NYMPH (*Cercyonis pegala ino*) — Fairly common in disturbed grasslands during August; 5/8/79, 11/8/79, 15/8/81, 23/8/81.

SMALL WOOD NYMPH (*Cercyonis oetus*) — Fairly common in disturbed grasslands from mid-July to the end of August; 20/7/75, 18/7/80 NK, 26/7/80, 15/8/81, 23/8/81.

VARUNA ARCTIC (*Oeneis uhleri varuna*) — Collected along the cut line; 10/7/82, 11/7/82.

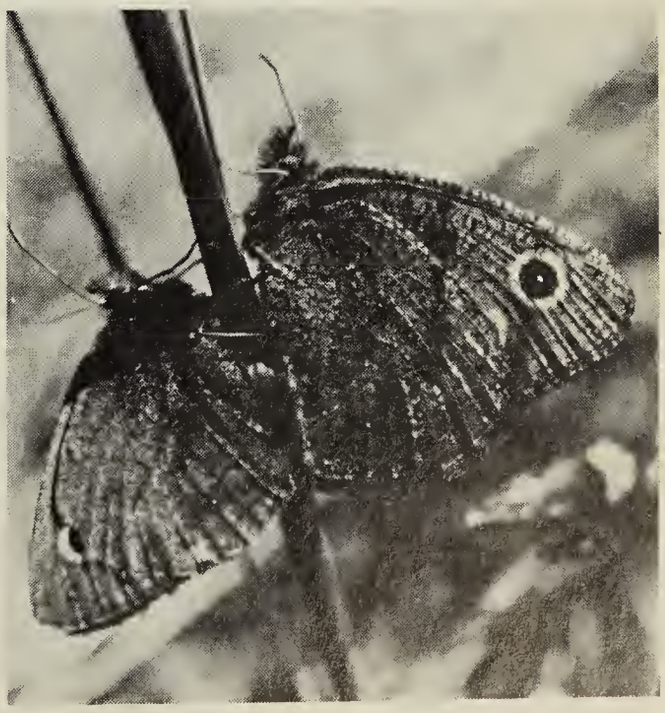
MACOUN'S ARCTIC (*Oeneis macounii*) — Collected once in Lodgepole Pine forest on 11/7/82. In Alberta this species is reported to fly commonly in odd-numbered years.

CHRYXUS ARCTIC (*Oeneis chryxus chryxus*) — Occasional along the cut line in Lodgepole Pine woods; 8/6/80, 10/7/82, 11/7/82; more common at higher elevations to the west of the study area on the east slopes of the Livingstone Range.

ALBERTA ARCTIC (*Oeneis alberta alberta*) — Occasional in disturbed grasslands in late May; 21/5/82, 22/5/82, 23/5/82, 24/5/82.

RED DISKED ALPINE (*Erebia discoidalis mcdunnoughi*) — Common in May 1982 in disturbed grasslands, roadside ditches, and along the cut line; 21/5/82, 22/5/82, 23/5/82, 24/5/82; there is a late record, 10/7/82.

COMMON ALPINE (*Erebia epipsodea epipsodea*) — Common in grasslands, along roadways, and on the cut line; flight period recorded from late May to late July; 19/7/75, 20/7/75, 11/7/77 NK, 31/5/80, 18/7/80 NK, 26/7/80 NK, 10/7/82, 11/7/82.



Common Wood Nymph. *Gary Anweiler*

Discussion

Sixty-one species, representing 6 of the 7 families of Rhopalocerans found in Alberta, were recorded in the study area as follows: Hesperiidae - 5 (8%), Papilionidae - 3 (5%), Pieridae - 9 (15%), Lycaenidae - 10 (16%), Nymphalidae - 25 (41%), Satyridae - 9 (15%). Table 1 compares the Rhopaloceran fauna of the study area to that of Alberta. As shown in Table 1, the Indian Grave fauna had a significantly greater portion of the fauna represented by the Nymphalidae and Satyridae, and a significantly lesser portion represented by the Hesperiidae and Lycaenidae, than the total Alberta fauna.

Of the 61 recorded species for the Indian Grave area, 47 (77%) have been reported in July. The greatest diversity of species occurs in mid-July. In southwestern Alberta, this compares with mid-June for Calgary, mid-July for Banff National Park, late July for Kananaskis Provincial Park, and early August for Plateau Mountain.[3 2 6 1]

The relatively large number of species recorded for the Indian Grave Campground study area is the result of the interspersion and melding of a variety of habitats within a small area. The grasslands element is represented by such species as Garita Skipper, Pembina Blue, Alberta Arctic and Varuna Arctic. The aquatic habitats support such species as the Draco Skipper along the creeks, and Gillette's Checkerspot, Frigga Fritillary, and Silver-bordered Fritillary in the wet areas dominated by grasses and willows. The Mustard White, Pink-edged Sulphur, Freija Fritillary, and Western Pine Elfin show a marked preference for Lodgepole Pine woods. Poplar woods are favoured by such species as the Tiger Swallowtail, Western Tailed Blue and Mourning Cloak. A number of species utilize more than one habitat owing to the distribution of their food plants. An example would be members of the genus *Speyeria* which freely feed on blossoms of thistles, fireweed, and gaillardia as adults with the larval food plants reported to be violets.

Because of the proximity of different habitats, namely subalpine and alpine meadows, to the west of the study area in the Livingstone Range, and the fact that the prevailing winds are from the west, windblown strays occur in the Indian Grave area. So far, the Clouded Parnassian and Creusa Marble have been recorded. Some other species that could be expected as strays from the Livingstone Range include the Comma or Labrador Skipper (*Hesperia comma manitoba*), Mead's Sulphur (*Colias meadii elis*), Nastes Sulphur (*Colias nastes streckeri*) and Small Copper (*Lycaena phlaeas arethusa*).

Favourable habitats already exist in the study area for a number of species

Table 1: COMPARISON OF INDIAN GRAVE STUDY AREA AND TOTAL PROVINCIAL RHOPALOCERAN FAUNA.

Family	*Indian Grave*		*Province*[6]	
	No. of Species	*Percent of Fauna*	*No. of Species*	*Percent of Fauna*
Hesperiidae	5	8%	27	17%
Papilionidae	3	5%	8	5%
Pieridae	9	15%	19	13%
Lycaenidae	10	16%	36	24%
Nymphalidae	25	41%	46	30%
Danaidae	0	0	1	0.6%
Satyridae	9	15%	15	10%

not recorded to date. These expected species would include Roadside Skipper, Peck's Skipper, Long Dash, Arctic Skipper, Northern Cloudy Wing, Giant Sulphur, Sara Orange Tip, Zephyr Angle Wing and Variegated Fritillary.

Acknowledgements

I would like to thank Norbert Kondla for supplying me with his collection data, and for reviewing the manuscript.

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[6] KONDLA, N. G. and C. D. BIRD. 1979. The skippers and butterflies of Kananaskis Provincial Park, Alberta. Blue Jay 37:73-85.

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LACEWINGS AND APHIS LIONS

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One of the author's principal research concerns was the diamondback moth and its larvae (*Plutella xylostella* L. (Plutellidae)), an occasional pest of Brassica seed crops in Saskatchewan. In an earlier paper in this journal, I briefly described two hymenopterous parasites of diamondback larvae. Here, I wish to write about another naturally occurring biological control agent, one predator that seemed potentially significant in the natural control of the diamondback. It is one of the lacewings, *Chrysopa carnea* (Neuroptera: Chrysopidae).

Lacewing larvae are commonly called aphis lions, aphids being a common prey. Aphis lions are active little creatures, their appearance suggesting tiny alligators, with their mouth parts extended to form a pair of "pincers", with which they puncture and drain the juices out of anything defenceless and tender enough to handle. They will sometimes even take a pinch at one's bare arm, no doubt trying it for flavour and tenderness. Completing larval growth rather quickly under good conditions, they spin a small spherical cocoon resembling a miniature tennis ball. Out of this soon emerges a pale green adult lacewing, seeming to be much too bulky ever to have developed in such a tiny space. They are occasionally seen in open spaces in low, clumsy-looking flight.

It was known that aphis lions were broad spectrum feeders, but small scale experiments were first set up for assurance that they would feed on diamondback eggs (easy targets), larvae alone, and especially, larvae in the presence of aphids. It was thought that aphids might be a preferred food, but it turned out that the predators did not discriminate.

The next step was to set up a cage

experiment in biological control, in the greenhouse. This was done with some background experience with rearing both prey and predator; the former was extremely easy to rear in a confined space, the latter almost as easy, if some debris was provided as concealment from cannibalism, which was probably never completely avoided. Potted winter rapeseed plants were used as food for the diamondbacks, as they remained vegetative. On Day 1, one male and one female moth, newly emerged, were entered in the experiment; this was repeated on Day 7. In the period Day 3 - 21, 14 entries of young chrysopid larvae were entered at the rate of five per entry. By Day 20, all surviving diamondback progeny, a total of seven, had emerged as moths. There are no data on how many eggs and larvae were predated. By Day 35, 18 lacewing adults had emerged, a yield of 26%. On the same day, the next generation of diamondbacks was entering pupation.

About 165 3rd generation moths emerged. From these, uncounted thousands of blotch leaf mines, originally containing the hatchling diamondback larvae, were visible on the food plant foliage. The new crop of aphis lions, synchronous with the prey larvae, cleaned up virtually all of them, along with any aphids present. The result was quite dramatic.

In retrospect, the experiment described above turned out to have been programmed, as it were, to produce the observed result. Both predator and prey were in unnaturally high concentrations, to mention only one unnatural feature of the experiment. The main point about it was that while the diamondback (prey) component in the culture was into its third generation, the lacewing (predator) part was into its second. Thus the second generation prey larvae were missed altogether. If this differential developmental rate applies to the slower developing field conditions as well, the second larval generation of diamondbacks, which is the crucial one from the point of view of potential damage, would be unaffected. There may be some significance to this, as aphis lions have been taken in sweep netting at a time too late to be useful as agents against diamondbacks. However this is an observation that needs much more thorough scrutiny. Aphis lions develop quickly in the presence of ample food, and the pupal stage in the cocoon does not seem long, but, as some authors have claimed, the pre-oviposition period in the adult seems lengthy.[1]

C. carnea, as an insect-eating predator, has received a lot of research attention in recent decades. Entomologists in California developed a mass rearing technique based on feeding the aphis lions on eggs and larvae of the potato tuber moth, and the adults on foods formulated to improve egg production. A few years ago, and perhaps still, *C. carnea* material could be purchased commercially for mass release. One application was for the control of mealy bugs on high value fruit trees. Experimental releases on field plots for the control of certain cotton insects were reported to be successful. It is difficult to see how such a release procedure could be applied on a field scale against, for example, diamondback larvae in a million-hectare crop. Meanwhile, although the cost-benefit ratio of such an investigation might be questionable, it would be interesting to examine the bionomics of this predator in our rapeseed/canola fields with care.

The author carried out the experiments described above while in the employ of the Agriculture Canada Research Station, 107 Science Crescent, Saskatoon, Saskatchewan S7N 0X2, using the Station's facilities.

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WAVED SPHINX AT THE PAS, MANITOBA

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During 30 years of collecting insects in The Pas area, I have only twice previously seen this large grey hawk moth, the Waved Sphinx (*Ceratomia undulosa*), hovering over late blooming lilacs after sunset, and failed to net it both times! Ash is one of the main food plants of this moth, therefore it should occur here as ash trees grow wild in this area along the river at Rhalls Island and also in quantity in the valley west of town. The area is likely on the northern edge of this hawk moth's range in the prairie provinces. It was therefore a marvelous experience to find a perfect specimen sitting on a brick wall of the Margaret Barbour Collegiate on 31 July 1982.

Mercury vapour lights at the ten foot level on the outside walls of the school draw insects in great numbers to sit on the bricks. They are easily collected into insect killing bottles. One can be very selective in collecting, as thousands of insects of many orders congregate at the lights.

This summer another locally taken Waved Sphinx was seen in a student's collection. This moth came from the valley west of The Pas, bordering on The Pas river.

The Waved Sphinx Moth is more frequent in Southern Manitoba. On 6 July 1962 many were seen at the north gate of Riding Mountain National Park just south of Dauphin, Manitoba. Franklin and Paul Chermock (veteran collectors and writers on American insects) and I saw dozens circling the flood lights at the gate. Paul collected several specimens that are now in the Allyn Museum of Entomology at Sarasota, Florida. (The entire Chermock collection has been moved there from Baltimore, Maryland.)

Waved Sphinx; The Pas, Manitoba; 31 July 1982; W. Krivda: W. Keetok. Terry Dartnell

I have found the best place to collect hawk moths in this area, is at Lilac trees just after sunset. They fly in the early part of the evening, till perhaps 10:00 p.m. in any number and seem to drop off after that time. This may be due to temperature changes or simply that they have had their fill of nectar and are no longer feeding.

The different hawk moth species vary in number here from year to year. Some that were frequent in the 1950's and 60's are now scarce; the Black Apple Sphinx (*Sphinx gordius borealis*), and that magnificent giant the Big Poplar Sphinx (*Pachysphinx modesta borealis*) are two cases in point. These may well vary numerically in cycles of greater or lesser duration. Collecting over many years can help to elucidate some of these cycles. Other hawk moths, like the Clemens Hawkmoth (*Sphinx luscitosa*), seem to always be rare and are not seen for years at a time. These may also be on the edge of their geographic range here and survive in favourable years only to disappear again.

GROWING WALLEYE FINGERLINGS IN SMALL LAKES

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Saskatchewan has about 94 thousand lakes which cover about 13% of the province surface area. Only a small portion (perhaps not more than 10%) of these lakes are readily accessible. There are some 14 hundred commercial fishermen and over 230 thousand active anglers who fish in the province. They take a total of close to 10 million kg of fish annually, contributing significantly to the provincial economy.

Growing fishing pressure, particularly from an increasing number of anglers, together with other factors such as pollution and habitat loss, have created problems in a number of lakes. A decline, and in some cases a collapse, in the stocks of walleye — the most sought-after game fish — in the more heavily-fished lakes has taken place in recent years.

The Fisheries Branch of the Department of Tourism and Renewable Resources has attempted to bolster the declining fish stocks by stocking fry straight from the hatchery into the lakes. The results have not always been satisfactory; predation by existing fish and competition for food are possible causes of massive fry mortalities. On the other hand, it has been demonstrated that production of walleye stocks can be successfully maintained or enhanced by planting rearing-pond-grown fingerlings rather than fry (e.g. in Minnesota and Wisconsin). The fry have a better chance of surviving if they are first raised in small, fertile and predator-free natural lakes or man-made ponds before being released into the problem lakes.

The Fisheries Branch initiated a pilot project two years ago to test the feasibility of growing walleye from fry to fingerlings in ponds or small lakes for later transfer into problem lakes. This article summarizes the major findings of the project.

The Rearing Ponds

As shown in Figure 1, the lakes used as rearing ponds fall into two geological regions: the shield-boundary (Ponds 1-4) and the sedimentary (Ponds 5-7). These ponds were selected mainly for their relatively small size (less than 24 ha, except Pond 4 which is 169 ha), shallow depth (maximum less than 3 m) and proximity to the problem lakes.

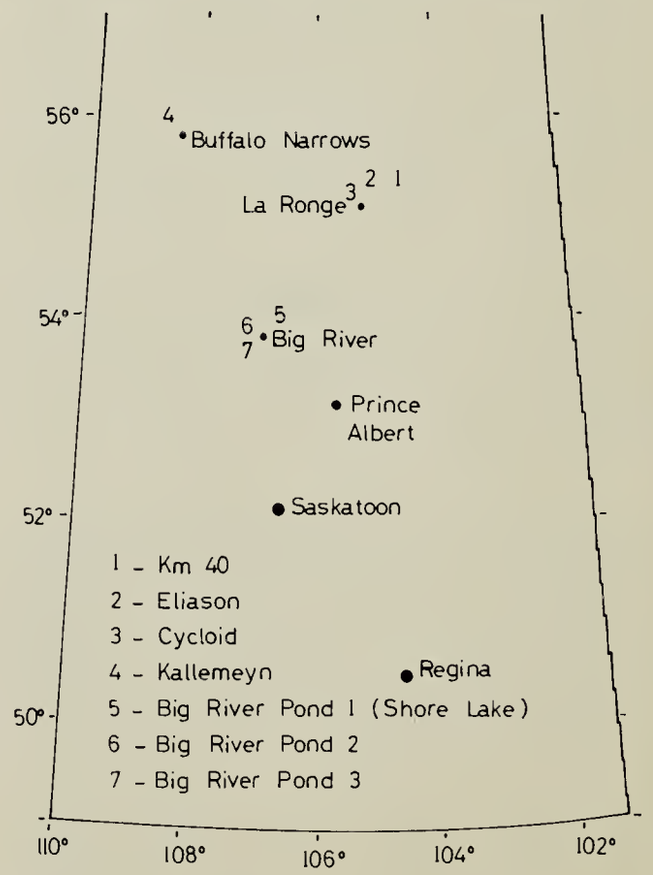


Figure 1. *Location of the walleye rearing ponds.*

Surface water temperatures during the period May-August ranged from 10 to 26°C with averages of 16-20°C. The ponds warm up earlier and faster than adjacent larger lakes in the spring — an advantage to fry stocking.

There appeared to be abundant zooplankton (food for fry and fingerlings) in all ponds except Pond 5. The luxurious growth of submerged weeds in this pond seemed to have suppressed the growth of algae, resulting in a low production of zooplankton.

There were no native fish in the three ponds at La Ronge. Numerous Brook Sticklebacks were found in Pond 4, while Fathead Minnows in addition to sticklebacks were present in Pond 5. However, due to severe winterkill, these fish were nearly wiped out in 1982.

Stocking of Fry

Walleye fry newly hatched at the Qu'Appelle Fish Culture Station or the Lynx River Hatchery (north of La Ronge) were used for stocking the rearing ponds. The stocking was done in late May to early June. The rate of stocking varied from 600 to 6,000 fry/ha with an average of 3,140 fry/ha.

Food of Fingerlings

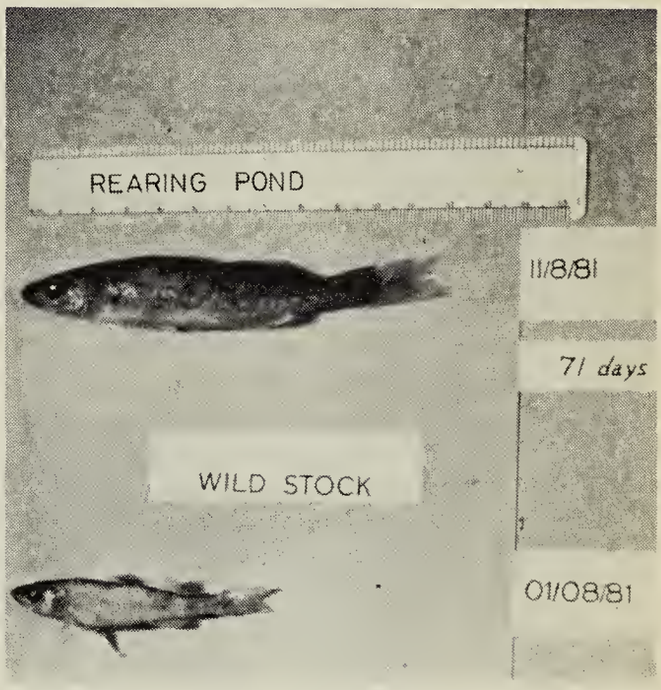
The diet of walleye fingerlings differed from one pond to another, depending on the availability of food organisms. It appeared that larvae and pupae of chaoborus and cladocerans were the most frequently eaten food items. The number of chaoborus larvae ingested by a large fingerling (around 144 mm fork length, from nose tip to base of tail fork) could be as many as 454 individuals.

In addition to chaoborus and cladocerans, organisms such as amphipods, beetle larvae, mayfly larvae, back swimmers and sticklebacks were found in the diet of larger fingerlings.

The food condition in these ponds was generally good, as an average of 78% of the total number of fish examined for diet contained food in their stomachs.

Growth and Production

The growth of walleye in these rearing ponds was generally rapid. In 60 days, the fry had reached an average of 80-90 mm in fork length and about 6 g in weight. By the end of the summer, an average size of 120-130 mm and 18-20 g was attained.



A comparison of rearing-pond grown and wild stock walleye fingerlings.

Measurements suggest that the fingerlings grew fast up to about 70-80 days after stocking. Beyond this period (usually between the end of July and the middle of August), the rate of increase in length began to taper off. However, continuous good growth was possible if food organisms were still plentiful in the pond.

The practical implication of the above findings on growth pattern is that there is little to be gained by keeping the fingerlings in the pond for more than approximately 80 days. Beyond this period, the fingerlings increase very little in length and much less in weight due to lack of food; thus, higher fingerling mortalities may be expected. Furthermore, larger lakes usually have abundant forage fish (e.g. perch and minnows) which is an excellent food source for the newly-released fingerlings. By changing from an invertebrate diet (in the pond) to a fish diet (in the lake), the fingerlings can keep on growing until the end of the summer. Being usually larger than the native fingerlings, the rearing-pond-grown walleye should have no problems in competing for food.

The survival of walleye in six of the rearing ponds from fry to fingerlings varied considerably from pond to pond and year to year. It varied from nearly zero to 16% (average 7%) which is poor but within the range expected for natural rearing ponds. Similarly, the density of the fingerlings, ranging from almost zero to 655 fish/ha, is low compared with figures from Minnesota (normal density around 19.4 thousand fish/ha) and Manitoba (average 900 fish/ha), but expected for natural rearing ponds. At an average weight of 5 g near the end of July, the highest density in Saskatchewan gives a fingerling production of 3.3 kg/ha, but this is not the highest yield in weight. A small fertile pond at Big River producing 14 kg/ha of fingerlings (density 468 fish/ha) in early September was the most productive rearing pond.

A total of 5,902 fingerlings were harvested from six of the ponds in both years. Of these, 3,942 were restocked into Lac La Ronge and 1,960 were transferred to Delaronde Lake. Harvesting was done by trapping, except for Pond 5 where the fingerlings were drained into Delaronde Lake via a newly-constructed channel. The recovery of fingerlings varied from 10 to 93% (average 57%), depending on the fishing intensity.

Conclusions

This project has demonstrated that it is feasible to grow walleye from fry to fingerlings in natural ponds in central and northern Saskatchewan. Growth was excellent, but recovery could have been better.

The poor recovery of the walleye in one pond (No. 5) in 1981 was probably caused by the lack of spring zooplankton blooms and the predation by the abundant sticklebacks and minnows. Therefore, native fish, if present, should be eradicated before fry stocking. This can be done by drawing down of pond water in the fall to ensure a winter-kill. The presence of numerous predaceous beetle larvae in all ponds might be partly responsible for the generally low recovery. The control of the predaceous insects is more difficult. However, measures used effectively elsewhere (e.g. using coal oil) should be tested for Saskatchewan situations, if possible. Furthermore, in order to have an adequate supply of food organisms for the fry, only naturally fertile lakes should be used as rearing ponds. Fertilization to promote zooplankton blooms in the spring will be necessary if a pond is not fertile, but otherwise suitable.

Since the completion of this project, several rearing ponds have already been set up for the production of walleye fingerlings. Although the enhancement program has moved from pilot to production phase, experiments are still required to test certain pond management techniques in order to maximize fingerling production. Also, the contribution of the fingerlings released for the restoration of depleted walleye populations needs to be monitored and assessed in the future.

RETICULATE MELANISM IN CANADIAN WESTERN PAINTED TURTLES

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In 1969 H. M. Smith, D. C. Kritsky, and R. C. Holland reported Painted Turtles (*Chrysemys picta*) from North Dakota which had an intricate pattern of narrow dark markings on the carapace, which they called 'reticulate melanism'.[20] They only saw this pattern on some large adults in the populations they observed, and the two melanic individuals they examined were both males. The colour pattern was similar to that of some males of Antillean sliders, especially the Cuban *Chrysemys decussata*, but different from that seen on any other turtle.[1] C. H. Ernst and R. W. Barbour have since asserted that "reticulate melanism commonly occurs in some populations of *Chrysemys picta bellii*" (caption of their Figure 124) the Western Painted Turtle and R. Conant has mentioned that reticulate melanism is confined to adult males.[5,4] C. H. Ernst and E. M. Ernst found it on both sexes in southwestern Minnesota, while R. D. MacCulloch found it only on males in southern Saskatchewan.[6,12]

This paper describes the widespread occurrence of reticulate melanism in western Canada, confirms that it is largely confined to adult males, and suggests hypotheses about its adaptive value.

Materials

I examined specimens in the collections of the National Museum of Natural Sciences, National Museums of Canada

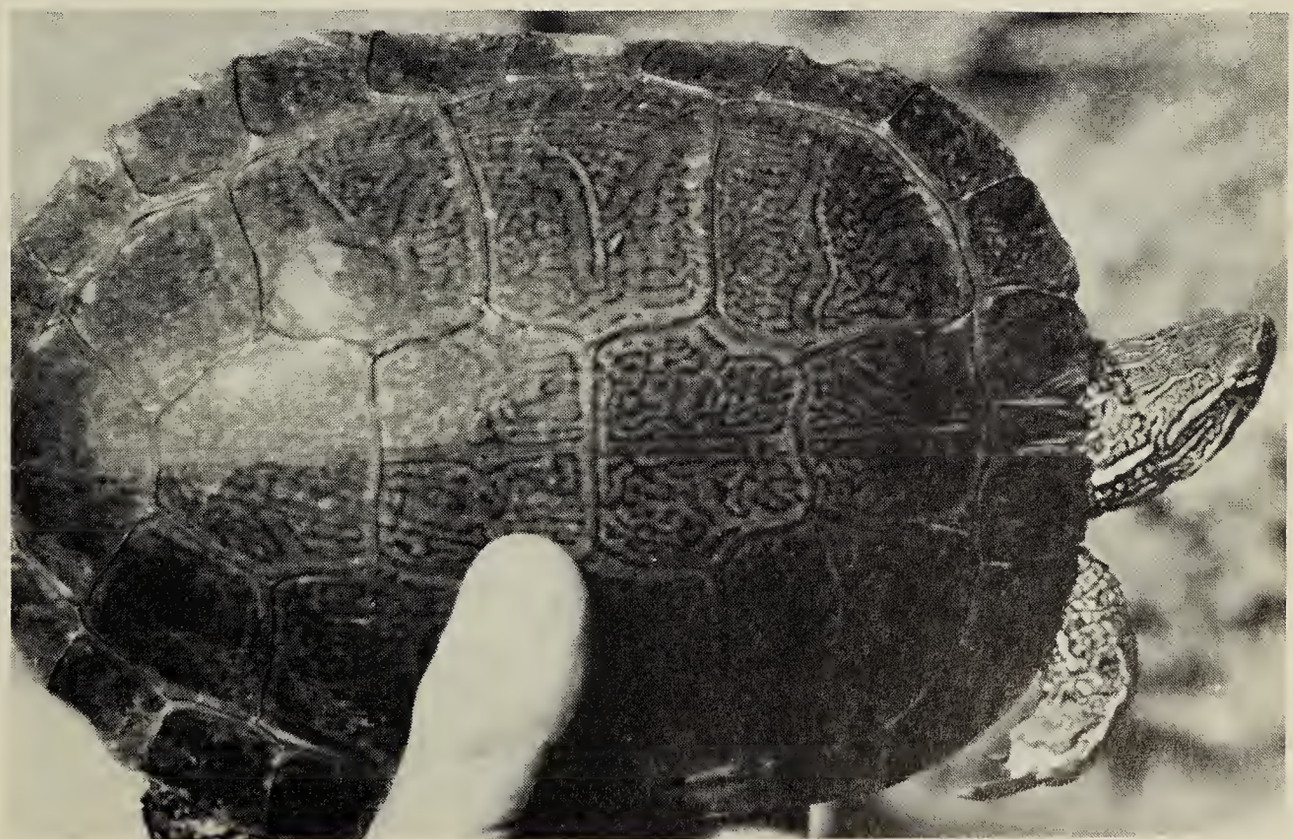

Figure 1. *Reticulately melanic male* Chrysemys picta *from Qu'Appelle River, Saskatchewan. Plastron 190 mm.* *R. D. MacCulloch*

(NMC), the Royal Ontario Museum (ROM), and the American Museum of Natural History. R. W. Campbell and N. Panter kindly examined the collections of the British Columbia Provincial Museum and the University of Alberta Museum of Zoology for me, and Ross MacCulloch of the Saskatchewan Museum of Natural History has allowed me to use his measurements, observations, and photographs.

Methods

I measured the size of specimens by plastron length and identified adult males by their long foreclaws and preanal tail length. I noted the intensity of reticulate melanic markings, and assessed the extent of reticulate melanism by the number of major laminae (the horny plates of the shell, excluding the marginals and nuchal around the edge of the shell) with reticulate markings.

I use the name "*Chrysemys picta belli*" in its usual sense, to denote western populations of *Chrysemys picta* with light carapace colours, extensive markings on the plastron, and a network of light markings on the carapace.[2 3]

Distribution in Canada

All localities where reticulate melanism has been found are mapped in Figure 2. Well developed reticulate melanism is largely restricted to large adult males. All of the large ROM and NMC specimens from western Ontario populations of *C. p. belli* are female. A reticulately melanic male was examined by F. D. Ross, Aleta Karstad, and me on a dock at Sioux Narrows, Ontario, in July 1976, but it was so tame that it may have been released by one of the many Manitobans who vacation there.

All large (plastron greater than 150 mm) male specimens I examined from Manitoba and Saskatchewan are reticulately melanic, and one female from Lake Sewell, Manitoba (NMC 8618-11) has a blurred reticulum. The male specimens are from Whiteshell Provincial Park (two specimens), Carberry (one), and Lake Sewell (nine), in Manitoba, and "Wood Creek (3.5 mi. northeast of Wood Mountain), Saskatchewan" (one specimen, NMC 1549, 22 July 1929; evidently Wood Mountain Creek). Ross MacCulloch has found melanic males in the Qu'Appelle River

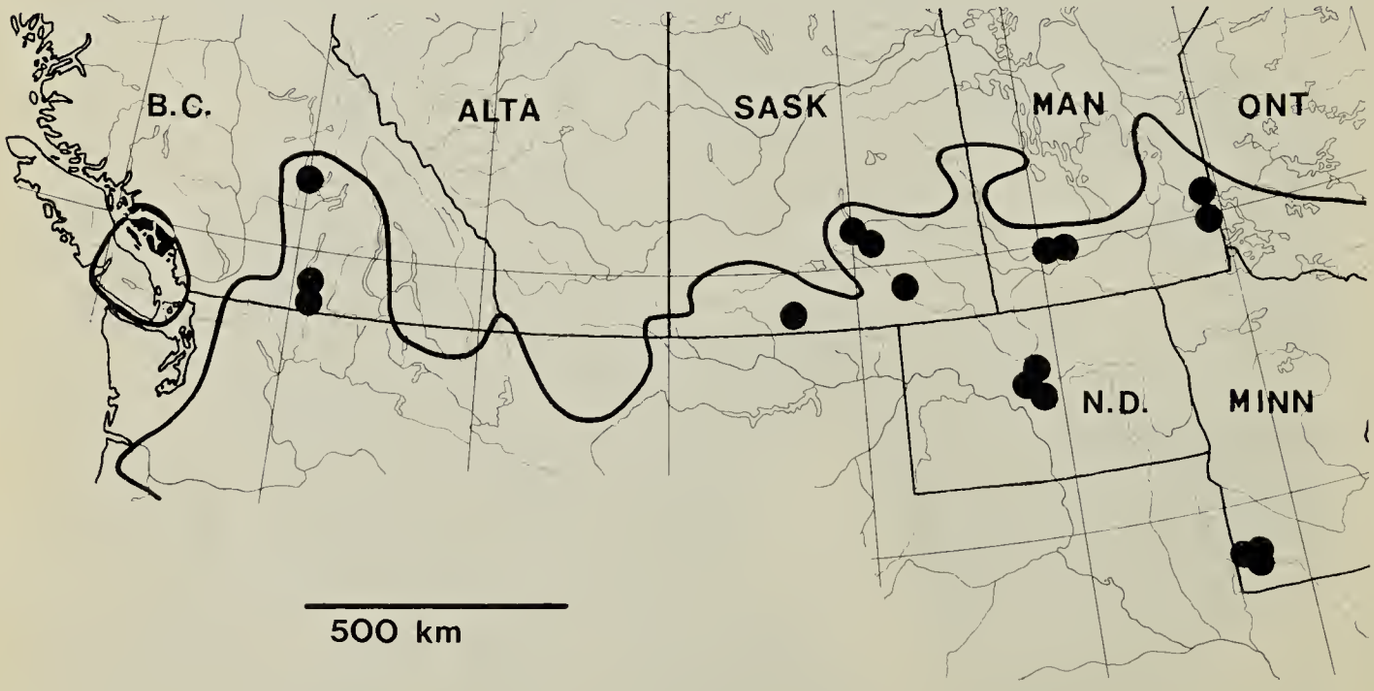

Figure 2. *Localities where reticulate melanism has been found in* Chrysemys picta. *Localities are listed in the text. The heavy line is the northern limit of the range of the species. A circle around Pender Harbour and Texada Island is darkened.*

between Craven and Lumsden (Figure 1), in Rinfret Creek 5 km SE of Weyburn, and Wascana Lake (where some turtles are introduced) in Regina, Saskatchewan (*in litt.*). There are no large males or reticulate melanism among the three specimens from the Milk River of Alberta (R. Panter, *in litt.*).

Some adult males from the interior of British Columbia are reticulately melanic. T. L. Thacker may have been the first to collect reticulately melanic *Chrysemys picta* (NMC 965) at Vaseux Lake in June 1922, but in his account of these turtles he does not mention this colour pattern.[21] G. P. Holland did not record reticulate melanism in his study of variation in coloration in British Columbia *C. picta*, but he only examined eight adult males.[11] There are NMC specimens of reticulately melanic males from Vaseux Lake (three specimens), Osoyoos Lake (two), and Genier Lake (three). In the sample from Genier Lake there are eight females which have faint or speckled melanism; this is also present on a 196 mm female from 1 km N. of Peachland, B.C. (NMC 17407). There is a large nonmelanic male from Osoyoos Lake in the B.C. Provincial Museum (No. 597; 162 mm). In ROM collections made in 1928 and NMC collections made in 1963 from small lakes in a valley west of Vaseux Lake the males are not reticulated (NMC 7213, Mahoney Lake, 165 mm; ROM 2582-2 & 3, Green Lake, 164, 171 mm carapace length), and all of the specimens have a dusky blackish colour in preservative rather than the brownish colour of most *C. p. belli*; some of the females are quite black (ROM 2580, 2585).

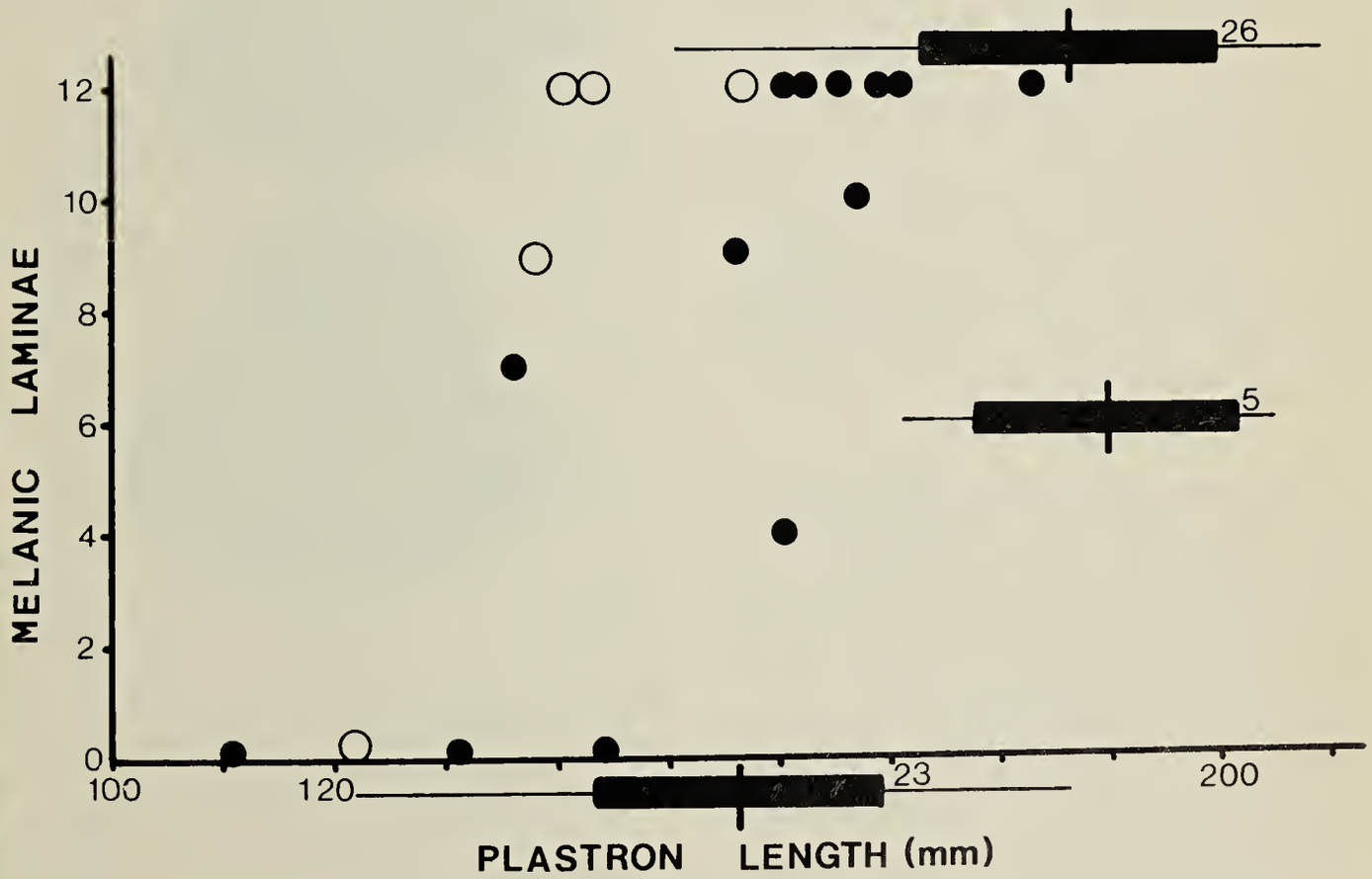

Figure 3. *Reticulate melanism in relation to size in male* Chrysemys picta. *These are sexually mature specimens, as indicated by elongated foreclaws. Specimens from Lake Sewell, Man. are shown as dots, those from Vaseux Lake by circles. Bar diagrams show range, mean, ± 2 standard deviations and sample size for specimens from MacCulloch's southern Saskatchewan sites; from the top down these were denoted as: "with reticulate melanism," "partial reticulate melanism," and "without reticulate melanism."*

Development of melanization

The following account is based on the assumption that less extensive melanic markings develop into more extensive patterns. The evidence for this is the larger size of completely melanic specimens (Figure 3); but some of the variation may really be individual variation in the final adult pattern. Unlike other coloration of *C. picta* the reticulate melanin is deposited in the horny laminae.[20] These markings appear after the development of the long foreclaws characteristic of adult males in this species, at a plastron length of about 140-150 mm at Vaseux Lake and Lake Sewell and about 170 mm in the Qu'Appelle River and Rinfret Creek (Figure 3). Melanization apparently develops from the dark borders of the light lines that outline the edges of the laminae and form a network elsewhere on the shell. Early stages can be seen in small males such as NMC 8621 (144 mm; Figure 4B). In this specimen many of the dark borders of the laminae are paralleled by another dark line which is separated from the border line by a gap of 2-4 mm. There are flecks of dark pigment elsewhere on the shell, but none between the parallel dark lines. In other specimens with less prominent dark borders on the laminae the initial black markings develop separately as in NMC 8057 (Figure 4A).

The head pattern of melanic specimens is a mottled or reticulated pattern of dark markings rather than the normal striped pattern (Figure 5). This change is brought about by a breakdown in the dark interstripe areas and an expansion of the light stripes into the interstripe. All of the fully reticulate NMC and ROM specimens have this modified head pattern. I quantified the disruption of the striped pattern in two ways among the Lake Sewell specimens: the median dorsal head stripe is shorter on melanic specimens (those with more than eight laminae with reticulation) than on non-melanic specimens (those with no

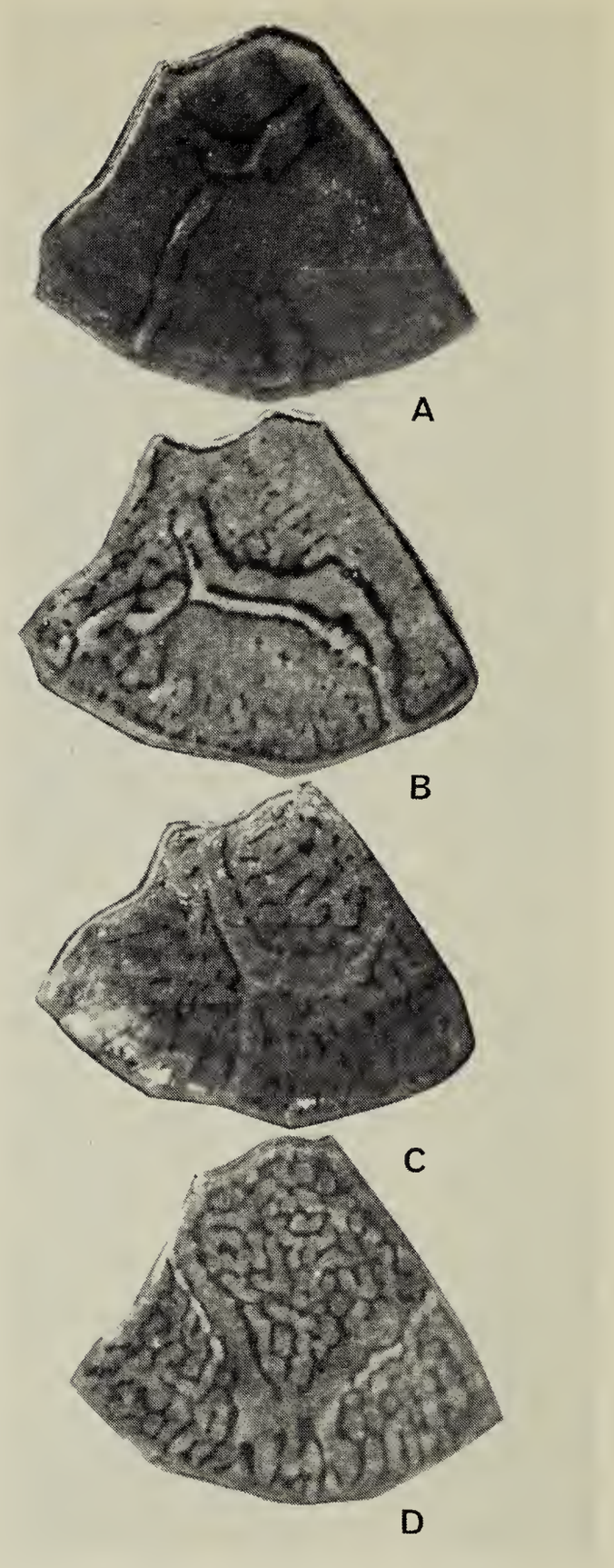

Figure 4. *Reticulate melanism on the first left lateral carapacal lamina of male* Chrysemys picta *from Manitoba. A. NMC 8057, 136 mm, 7 melanic laminae, 1 mi (1.6 km) S Bereton Lake, Whiteshell Park; B. NMC 8621, 144 mm, 12 melanic laminae, Horseshoe Lake, S of Carberry; C. NMC 8622-3, 169 mm, 12 reticulate laminae, Lake Sewell, E of Shilo; D. NMC 8614-4, 162 mm, 12 reticulate laminae, Lake Sewell, E of Shilo.*

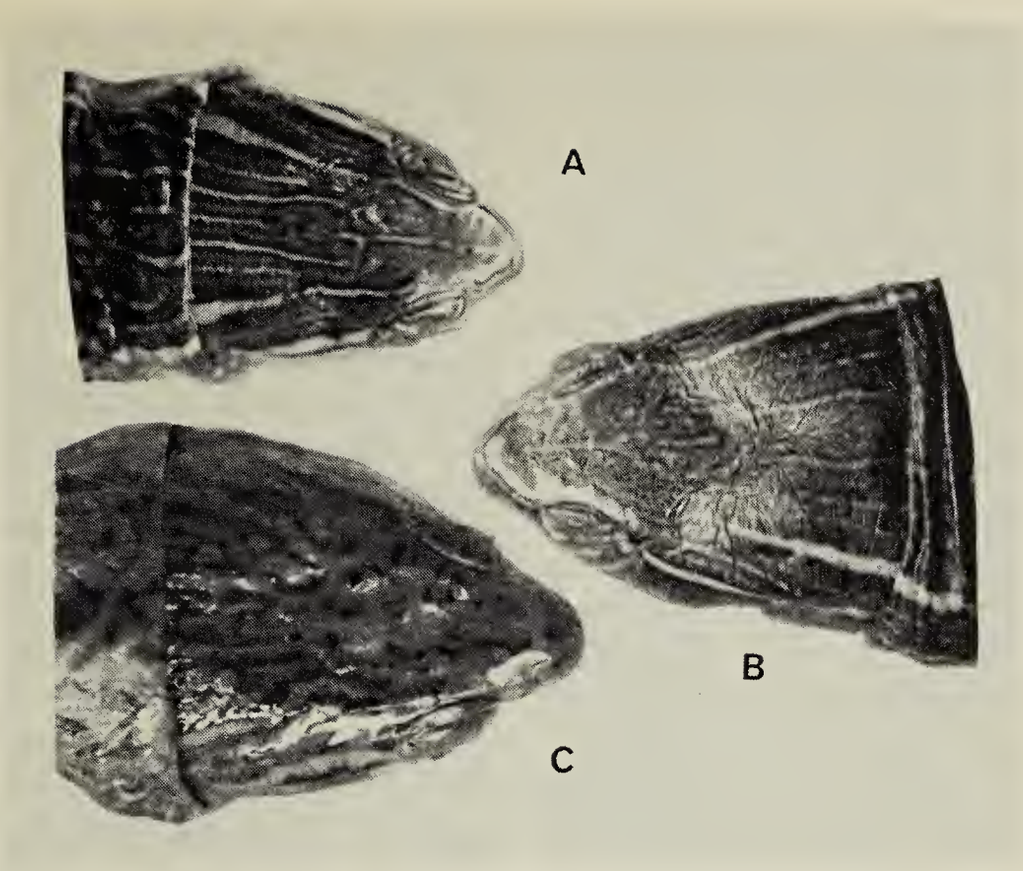

Figure 5. *Heads of* Chrysemys picta *from Manitoba. A. NMC 8622-5, female, 131 mm, no melanic laminae, Lake Sewell, E of Shilo; B. NMC 8057, male, 136 mm, 7 melanic laminae, 1 mi (1.6 km) S Bereton Lake, Whiteshell Park; C. NMC 8622-4, male, 165 mm, 12 reticulate laminae, Lake Sewell, E of Shilo.*

laminae with reticulation); of eight melanic specimens the median stripe extends beyond the narrowest point between the eyes on only one specimen, while it extends beyond this point on 16 of 19 nonmelanic specimens (of both sexes; $G = 9.7$, $p < 0.005$). In eight melanic specimens the average number of light dorsal longitudinal stripes on the head between the tympana of the ears was 2.37, while 18 nonmelanic specimens averaged 5.00 stripes ($t = 4.12$, $p < 0.001$). In the southern Saskatchewan populations examined by MacCulloch this change is less marked (Figure 1), and "the mid-dorsal head stripe extends both anterior and posterior to the narrowest point between the orbits." (*in litt.*, 29 Sept. 1981).

The striping of the legs and the plastral pattern seem unaffected by the melanism, though there may be minor quantitative differences.

Three of the eight lightly melanized females from Genier Lake have the median stripe reduced, but they average 3.8 stripes at the ears, compared with 4.0 for the two unmelanized males, and 2.3 for the three melanic males.

Discussion

Shell patterns like reticulate melanism are rare in turtles. In scanning several books of pictures of turtles I have found only one pattern that is much like it (beside the Antillean *Chrysemys* previously mentioned): a very lightly melanized Blanding's Turtle (*Emydoidea blandingi*; Pritchard, Figure on page 269).[3 5 17] Melanism is frequent in sliders of the *Chrysemys scripta* complex, but in populations of this species in the United States, at least, the melanism involves changes in the pattern of the plastron and blackening of the entire carapace and of the skin,

which is not seen in *C. picta*.[1 3 13] In this species, as in *C. picta*, the smallest fully melanized individuals are about 130-150 mm in most populations, the melanin extends into the horny laminae, and melanization is more frequent or intense in males, though females are also often melanic.[1 3 5 13] The tropical populations of *C. scripta* are extremely variable in colour pattern, and some seem to approach reticulate melanism, certainly the related Cuban Slider, *C. decussata*, has melanic males which are quite as reticulated as some *C. picta belli*. Melanization in this species evidently progresses both by the spread of dark pigment and by the lightening of already darkened areas, and the depigmented areas are a different colour from the unmodified areas. There is evidently geographic variation in Cuba in the importance of melanin spread and depigmentation in the development of the reticulate pattern. The striped pattern of the head and limbs gives way to a dark reticulum in the melanic males.[1]

Male colour patterns differ from those of females in being blacker, more contrasting, or both in about 25 aquatic turtle species in which there is a difference (Table 1). Besides the species listed in the table, the sexes of the softshell turtles *Trionyx ater* and *T. ferox* differ in carapace pattern, but neither sex is clearly more contrasting.[22] Males of the Asian river turtles *Callagur borneoensis* and *Batagur baska* are more different from each other and from the females during the breeding season, perhaps as a result of reproductive character dis-

Table 1. SEXUAL COLOUR DIFFERENCES IN AQUATIC TURTLES.[1 17 14 22]

How males differ from females	*Species*
Reticulate melanism	*Chrysemys picta belli* *C. decussata* *C. felis ?*
Black coloration	*Chrysemys scripta* *C. stejnegeri* *C. terrapen* *C. malonei* *C. decorata* *C. rubriventris* *Batagur baska*
Black dorsal stripes	*Kachuga trivittata* *Callagur borneoensis*
More distinct carapace pattern (at least in some populations)	*Trionyx spiniferus* *T. muticus* *Kachuga kachuga*
More contrasting head pattern	*Kinosternon scorpioides* *K. dunni* *Dermatemys mawi* *Podocnemis unifilis* *P. erythrocephala* *P. volgi* *Phrynops dahli*
Orange or red head colours	*Trionyx spiniferus emoryi* *Callagur borneoensis* *Kachuga kachuga*

placement.[14] In two terrestrial tortoises (*Geochelone elegans, Kinixys belliana*) females are more contrastingly marked than males.[17]

There are about 170 species of freshwater aquatic turtles, so about 15% of them have sexual colour differences.[17] This is certainly a lower proportion of differing species than occurs among birds or lizards, and higher than that among snakes or salamanders, or, perhaps, frogs or non-primate mammals. Since the males are so often the more contrastingly patterned sex it is likely that the differences are due to sexual selection acting through female choice or male combat.

There is a possible adaptive function for reticulate melanism in *Chrysemys picta* related to each of the possible functions of animal coloration: concealment, communication, and solar thermoregulation.[10] Such speculation is premature in terms of capability to test the hypotheses, but may suggest directions for future research.

Concealment hypothesis.

The suggestion that reticulate melanics are cryptic follows from the observation that similar reticulate patterns occur in prairie populations of the Northern Leopard Frog (*Rana pipiens*) and the Tiger Salamander (*Ambystoma tigrinum*). Several mottled or reticulate dorsal pattern variants of *R. pipiens* are sympatric with reticulately melanic *Chrysemys picta* on the northern Great Plains,[19] and *A. tigrinum* from this area are more reticulated in pattern than those from elsewhere in the species' range (though with differing patterns which are the bases for *A. t. diaboli* and *A. t. melanostictum*).[7] If such a pattern is particularly cryptic in prairie ponds it may allow turtles to approach prey or avoid detection by such predators as a 150 mm turtle may have. It is hard to see why only adult males should be melanic.

Communication hypothesis.

The function of the complex red, black, orange, and yellow colour patterns of *Chrysemys picta* is unknown, but at least the plastron colours may serve a communication function, since the plastron is not exposed to solar radiation or aerial predators and red and yellow are implausible as optimal concealment from aquatic predators. If the complex ventral pattern of *C. p. belli* serves some social function, then the repetition of a similar pattern on the dorsum may enhance the social status or courtship success of a male. The tendency for male aquatic turtles to be more contrastingly patterned suggests that such a pattern might be particularly advantageous to males.

Energy coloration hypotheses.

One hypothesis is borrowed from the studies of A. R. Gibson on the garter snake *Thamnophis sirtalis* at Long Point, Lake Erie, Ontario, where he could only account for the occurrence of an all-black morph by postulating that since male melanics absorbed more sunlight than the lighter-coloured striped morph, they were able to be more active, and thus had greater courtship success during the cool, early spring breeding season.[8 9 18] *C. picta* begins courtship at water temperatures as low as 10°C and if pale *C. p. belli* are energy-coloured (see Appendix), then in northern populations adult males that were darker might have higher body temperatures and greater activity and courtship success in the cold water of spring. This hypothesis has the advantage that the proposed adaptation benefits the northern adult males of a pale-coloured race, so it is not necessary to explain why other *C. picta* are not reticulately melanic. The opposite possibility exists, however: perhaps

the black markings, since they are in the horny laminae rather than beneath them as other markings are, serve to reradiate heat from the surface of the shell rather than allowing it to be trapped beneath the laminae where it would warm the turtle excessively.[8] Perhaps the melanization of the carapace is even only a developmental side effect of the reduction of melanin on the head.

The occurrence of geographically adjacent dusky-melanic and reticulately-melanic populations of *Chrysemys picta* (Green Lake - Vaseux Lake and Pender Harbour - Texada Island; see Appendix) should allow field study of the ecological determinants of carapace colour of *C. picta*. The concealment hypothesis would be falisified if the bottom colours of the lakes do not parallel the colours of the turtles, and one could discriminate between different energy-coloration hypotheses by measuring radiation patterns of turtles of different colours and by observing their basking behaviour.[16]

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Appendix: Some evidence that *Chrysemys picta* is energy-coloured.

W. J. Hamilton III introduced the term "energy coloration" to describe colorations which reflect or absorb light to optimize the temperature of the organism.[10] Both light and dark energy coloration have been invoked to explain the colours of reptiles. Snakes and lizards living on islands and peninsulas are frequently melanic and are thought to be energy-coloured black, and "superlight" coloration of heliothermic lizards is far more reflective than that of their backgrounds and is thought to prolong their surface activity in hot conditions.[8 15] It is supposed that up to the point that it is driven to a cool refuge by radiant heat loading, it is advantageous to an animal to be dark to maximize its metabolic rate, but if overheating often drives individuals into refuges it is beneficial to be light in colour and remain active at optimal temperatures for a longer period.[10]

I base the hypothesis that the coloration of *C. picta* is influenced by energy exchange considerations both on large-scale geographic variation and on the observation that among populations of *C. picta* examined in British Columbia, specimens from Texada Island were the lightest in colour, while those from across Malaspiza Strait at Pender Harbour were the darkest.[11]

The geography of Pender Harbour and Texada Island suggests that these sites differ in cloudiness. Northern Texada Island (where the lakes inhabited by turtles are found) is low enough that it does not cause much cloudiness by adiabatic cooling: the lakes are below 150 m elevation, and the highest points do not reach 460 m. Pender Harbour is sandwiched between the 730-880 m south end of Texada Island 20 km to the west and the 1250 m peaks of the Coast Range 7.5 km to the east. Among 101 ESSA satellite weather photographs of western North America taken from April through 1 October 1974 there were 46 in which cloudiness of northern Texada Island and the Pender Harbour area seemed to differ (these observations strain the limits of resolution of the photographs): in 37 cases Pender Harbour was cloudier. Similarly, at the Strait of Georgia at Vancouver Airport there are 1244 hours of bright sunlight from May to September; 146 more than at Vancouver "P.M.O." 12 km to the north (S of Stanley Park; North Vancouver, at the foot of the mountains another 6 km N, is well-known locally to be even cloudier), so that Vancouver Airport has as many hours of bright sunshine as stations in the prairies (Regina, 1348; Saskatoon, 1401; Brandon, 1231).[23] I conclude that the environmental differences between Pender Harbour and Texada Island are likely such that the availability of sunshine is a major difference between the sites, and that an energy coloration explanation of the colour differences between the turtle populations is supported. It would be very interesting to know if turtles from either of these populations are reticulately melanic.

WHISTLING SWANS BREEDING IN SASKATCHEWAN PARKLAND

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The Whistling or Tundra Swan breeds in Alaska from Bristol Bay, along the Bering Sea coast and throughout the sub-arctic and arctic tundra adjacent to the Arctic Ocean east to Baffin Island (Figure 1).[3] It nests chiefly north of the Arctic Circle to about 79°N. latitude.[6 22] The southern limits of the breeding range have not traditionally extended below 60°N. latitude with birds present south to Nottingham and Southampton Islands, the barren grounds of northern Canada, the Alaska peninsula and St. Lawrence Island.[4 6 12 3]

There has been a recent southward extension of Whistling Swan breeding range into areas where the species was extirpated toward the end of the 19th century, particularly around James Bay and the southern part of Hudson Bay.[18 13] Whistling Swans have also been reported breeding on the coast of Quebec north of 58°N. latitude.[10] Although this species has successfully pioneered the northeast coast of sub-arctic Quebec and the number of breeders is increasing in the Hudson Bay Region, nesting densities are sparse south of the tree line. A small population nesting near the Thelon River, Northwest Territories, appears to represent the southern limit of the breeding range, exclusive of southern Hudson Bay and James Bay.[2] In Saskatchewan, Whistling Swans have been known only as migrants.[15 8]

During Canadian Wildlife Service aerial waterfowl inventories in west-central Saskatchewan in 1973, four adult swans and one brood were observed north of North Battleford (Figure 1). The occurrence of these birds within former Trumpeter Swan breeding range and their proximity to present breeding areas in Saskatchewan (Cypress Hills) and Alberta (Grande Prairie) led to the assumption they were Trumpeter Swans.[3 17] The range of Trumpeter and Whistling Swans do not overlap, with the exception of western Alaska.[11]

Subsequent investigations revealed obvious differences in nest site selection and egg size between Trumpeter Swans in the Cypress Hills and the newly discovered swans. Studies were initiated to identify the swans nesting farther north in Saskatchewan.

Study Area and Methods

The birds were located in the aspen parkland of west-central Saskatchewan approximately 90 km north of North Battleford.[5] Topography is gently to moderately rolling with ponds located in the many depressions. The area is characterized by the interspersion of two principal biotic communities, the grassland and parkland forest.[21] Climate, soils, topography and vegetation of this region have been summarized by Bird and Richards and Fung.[5 21]

The Canadian Wildlife Service conducted aerial surveys during May and July 1973 through 1979 to locate swans and nest sites. During ground studies at the nest site, clutch and egg sizes were determined, and characteristics of the nest and its location recorded. An adult bird, flightless during the moult, was captured in July 1979 to confirm iden-

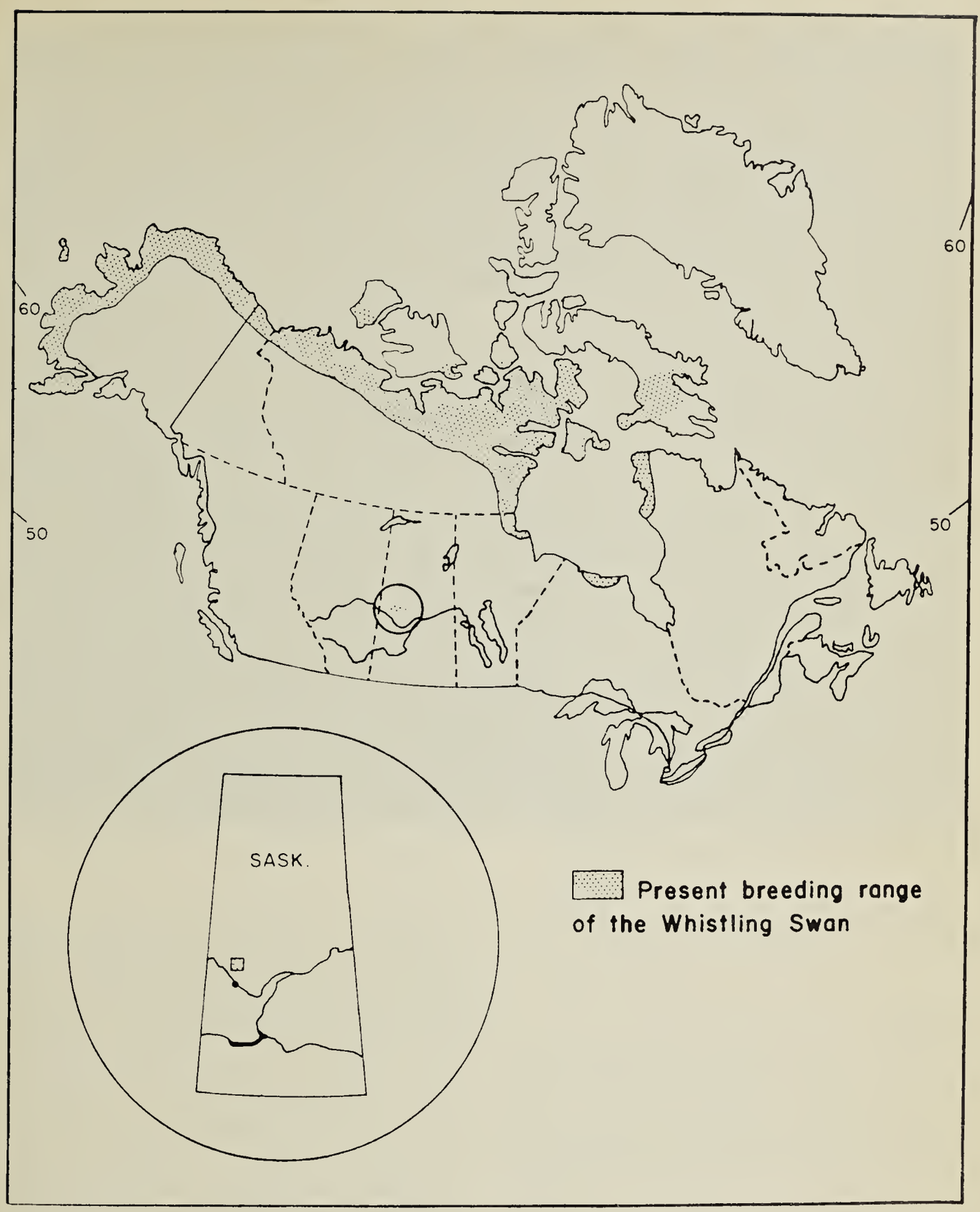

Figure 1. *Breeding range of the Whistling Swan (*Olor columbianus*) in North America (after Bellrose[3]; Lumsden[13]; Pakulak and Littlefield[18]).*

Whistling Swan nest, 1978. *Dan Nieman*

tification. The bird was banded and various measurements taken.

Results

A pair of swans has nested annually in west-central Saskatchewan from 1973 through 1980 except for 1975 (Table 1). Mean clutch size was 4.8 and an average of 1.9 cygnets was fledged per year. Two non-breeding swans, possibly sub-adults, were observed in the vicinity in 1973, 1975 and 1980.

The same nest site was used each year and differed in construction and location from typical Trumpeter Swan nests. Trumpeters usually nest over water and in emergent vegetation, often constructing a "moat" around the nest by removing surrounding vegetation for the nest structure.[3] The nests studied were on a 4-ha island, in upland vegetation 15 m from the water and beyond the wet meadow zone. They were located near small, sparse willows (*Salix* spp., approximately 1 m high) which partially obscured the incubating birds. Whistling Swans typically nest in such habitat on shores of lakes or islands.[4 22 3] The 1979 nest was 152 cm in diameter with a 70 cm bowl. It was constructed primarily from unidentified grasses and mosses, willow twigs, annual weeds (*Sonchus* spp.), bog rush (*Juncus* spp.) and sedges (*Carex* spp.). Nest bowl measurements and materials used for construction conformed to Whistling Swan criteria.[14 6 8 3]

Sixteen eggs were measured. The values differed markedly from Trumpeter Swan eggs and conformed to Whistling Swan egg measurements from other studies (Table 2).

Table 1. POPULATION STATUS AND PRODUCTION OF WHISTLING SWANS IN THE NORTH BATTLEFORD STUDY AREA, SUMMER 1973-1981.

Year	*Breeding Pairs & Nests*	*Number of Eggs*	*Fledged Cygnets*	*Non-Breeders*
1973	1	4	2	2
1974	1	5	0	0
1975	0	0	0	2
1976	1	*	1	0
1977	1	7	4	0
1978	1	*	*	0
1979	1	7	*	0
1980	1	6	3	2
1981	1	*	3	0
Mean	1	5.8	1.9	0.7

* Unknown

On 30 July 1979 two adult swans and two cygnets were approached by canoe. At 200 m, one adult took flight, vocalizing in a manner characteristic of Whistling Swans.[24 8 3] The remaining adult, flightless due to moulted wing remiges, was captured and examined.

Yellow lores, present on most Whistling Swans, but never occurring on Trumpeter Swans were obvious.[24 6 8] Five body measurements confirmed its identification as a Whistling Swan (Table 3).

Discussion

The Whistling Swans nesting in west-central Saskatchewan are approximately 1500 km south of the traditional and present breeding ranges of this species. This represents the first breeding record of wild Whistling Swans south of 60°N. latitude in North America except for the Hudson Bay area, a tundra region which is actually a low-latitude extension of the arctic biome.[7]

The Whistling Swans breeding in Saskatchewan occupied atypical habitat

Table 2. MEASUREMENTS OF WHISTLING AND TRUMPETER SWANS EGGS.

Mean values and standard deviations of Egg Measurements (mm)

Species	*Length*	*Width*	*Source*
Whistling Swan	105.8 ± 1.5	68.4 ± 1.5	Saskatchewan (16 eggs; this study)
Whistling Swan	105.2 ± 4.9	68.4 ± 2.5	Alaska/Hudson Bay[19]
Whistling Swan	106.8 ± 2.7	68.9 ± 1.1	Hudson Bay[18]
Trumpeter Swan	117.4 ± 8.8	75.0 ± 1.0	Alaska[9]
Trumpeter Swan	110.9 ± 4.5	72.4 ± 2.0	Red Rock Lakes[1]

Adult male Whistling Swan, 1979. *Dan Nieman*

for this species. These birds nested on an 1100-ha lake located in the aspen grove parkland, a mosaic of grassland and forest characterized by light-colored forest soils (grey and dark grey wooded).[21] About 35 percent of the uplands adjacent to the lake support stands of aspen (*Populus tremuloides*), willow (*Salix* spp.) and associated low shrubs. Most of the native grassland has been cultivated for cereal grain production (approximately 65 percent of the surrounding uplands).

Nearly half the lake shoreline is cultivated to the water's edge; the remainder supports woody vegetation and grasses. The lake bottom and portions of the shoreline are very rocky. Scattered stands of bulrush (*Scirpus* spp.), 10-15 m wide, occur along the shoreline and surround the nesting island.

The nesting of Whistling Swans in Saskatchewan is considered an isolated incident, and not a southward expansion of the breeding range of the

Table 3. BODY MEASUREMENTS OF WHISTLING AND TRUMPETER SWANS.

	Mean Values (Ranges in parentheses)				
Species	*Culmen (mm)*	*Tarsus (mm)*	*Total Length (cm)*	*Weight (kg)*	*Source*
Whistling Swan	101.0	115.0	128.0	7.6	Saskatchewan (this study)
Whistling Swan	102.6 (97-107)	111.9 (105-117.5)	132.0 (121.9-144.8)	7.3	Banko Bellrose[1 3]
Trumpeter Swan	112.5 (104-119.5)	122.9 121.5-126)	149.9	12.5	Banko[1]

species. The breeding lake functions as an important spring and fall staging area for swans migrating through the province. Possibly a bird was injured during spring migration, unable to fly and its mate remained with it to nest, homing to the same site in subsequent years.

Non-breeding swans observed in the vicinity may be progeny from the nesting pair, returning to the area from which they fledged. However, sub-adult Whistling Swans have been known to remain south of the tree line during the breeding season.[20 23]

A pair of swans has been observed nesting in this area since at least 1969 (E. Urbanowski, pers. comm.). With continued protection, and some recruitment of young, the species may continue to do so for some time.

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Lake where Whistling Swan nest located. *Dan Nieman*

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TREES AND THE RED-TAILED HAWK IN SOUTHERN SASKATCHEWAN

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The Red-tailed Hawk is one of North America's most widely distributed raptors. Over the past 100 years, it has expanded its range and replaced the Red-shouldered Hawk in much of eastern North America and it has usurped the territories of Swainson's and Ferruginous Hawks in parts of the West.[4 5] In southern Saskatchewan, these last two species were common when the northern Great Plains were first settled, and the Red-tailed Hawk was relatively uncommon. Since then, both Ferruginous and Swainson's Hawks have declined and the Red-tailed Hawk has spread and increased greatly in numbers. The spread of the Red-tailed Hawk here appears to be related to suppression of the almost annual range fires that kept the prairie treeless. By stopping fires, settlers started a gradual recolonization by trees in grasslands throughout North America.[35] In southern Saskatchewan, many areas of once-open prairie gradually began to be dotted with clumps or bluffs of aspen poplar. Because the Red-tailed Hawk is a woodland species that nests at the edges of open areas, the increase in trees has favored the Red-tail and contributed to its local increase in the recent past.[2 4 43]

The accounts of early explorers and fur traders give a picture of the native prairie as a treeless expanse maintained by recurring range fires. For example, in 1820, west of Prince Albert at what is now Lily Plain, John Franklin noted: "A

Aspen groves, west of Indian Head. *Lorne Scott*

long track on the south shore . . . is destitute of any thing like a tree, and the opposite bank has only stunted willows."[10] As he continued along the North Saskatchewan River, Franklin described the land extending south and west, beginning at a point 20 miles northeast of Carlton as "the barren grounds." He noted that both banks were now bare of trees and that "vast plains . . . afford excellent pasturage for the buffalo."[10] John Richardson called the area between the north and south branches of the Saskatchewan River, "the Plains of the Saskatchewan," and only east of Carlton were the plains "beautifully ornamented by numerous small clumps of aspens, that gave a rich picturesque effect to the landscape, which I have never seen equalled even in an English park."[32] Even north of the North Saskatchewan River, on the trail to Green Lake from the river opposite Fort Carlton, there was a 16-mile stretch of treeless plain that was "an unvarying level, destitute of wood, except for one small cluster of willows."[10]

In 1872, George M. Grant's map showed that the Touchwood Hills, north of the Qu'Appelle River valley, were wooded; to the east, the Little Touchwood Hills, now known as the Beaver Hills, were "partially wooded" with "Aspen Poplars, Birch & Willows forming artificial looking clumps, giving the country a rich Park-like aspect." However, in the Qu'Appelle valley itself there was then "very little timber" and "the plains in the vicinity are bare."[12] John Macoun in 1883 confirmed the treelessness of the area in his statement: "That part of the prairie lying west of Moose Mountain, and a line connecting it with the Touchwood Hills, may be said to be wholly without wood, between the Boundary and lat. 52° north. Wood Mountain and the Cypress Hills, together with the narrow river valleys, are the only exceptions."[27]

Dominion Lands Survey township maps of the 1880s provide further details concerning the proportions of grassland, woodland, and marsh in the decade immediately before appreciable settlement in southern Saskatchewan began. This material has been summarized and mapped by Archibold and Wilson.[1] It shows that only a few townships in the Touchwood Hills, Beaver Hills, and Moose Mountains then had 45% or more wooded area. Most of the area was open grassland (Figure 1), though aspen roots were present throughout what is now "aspen parkland" (Figure 2).

As for the range fires, we know that at Fort Carlton fires broke out almost annually.[41] John Palliser in 1857 commented that "a spark from a pipe may be sufficient to set 200 square miles of prairie in a blaze. The Indians are very careless . . . and frequently fire the prairie for the most trivial reasons; frequently for signals to telegraph to one another concerning a successful horse-stealing exploit or in order to proclaim the safe return of a war party. The disastrous effects of these fires consist principally in denuding the land of all useful trees."[39] In 1858, Palliser continued: "Thus large tracts of country now prairie lands have at one time grown valuable forests, and their present absence is the result of the repeated ravages of fire."[39]

Henry Youle Hind reported a massive fire in September 1857, which covered an area "one thousand miles in length and several hundreds in breadth . . . from the 49th parallel to the 53rd, and from the 98th to the 108th degree of longitude."[14] Near Oak Lake in southwestern Manitoba, Hind was more specific. There, he recorded that "the annual fires prevent the willows and aspens from covering the country, which they would undoubtedly do until replaced by other species, if not destroyed to within a few inches of the root every time the fire sweeps over them."[14]

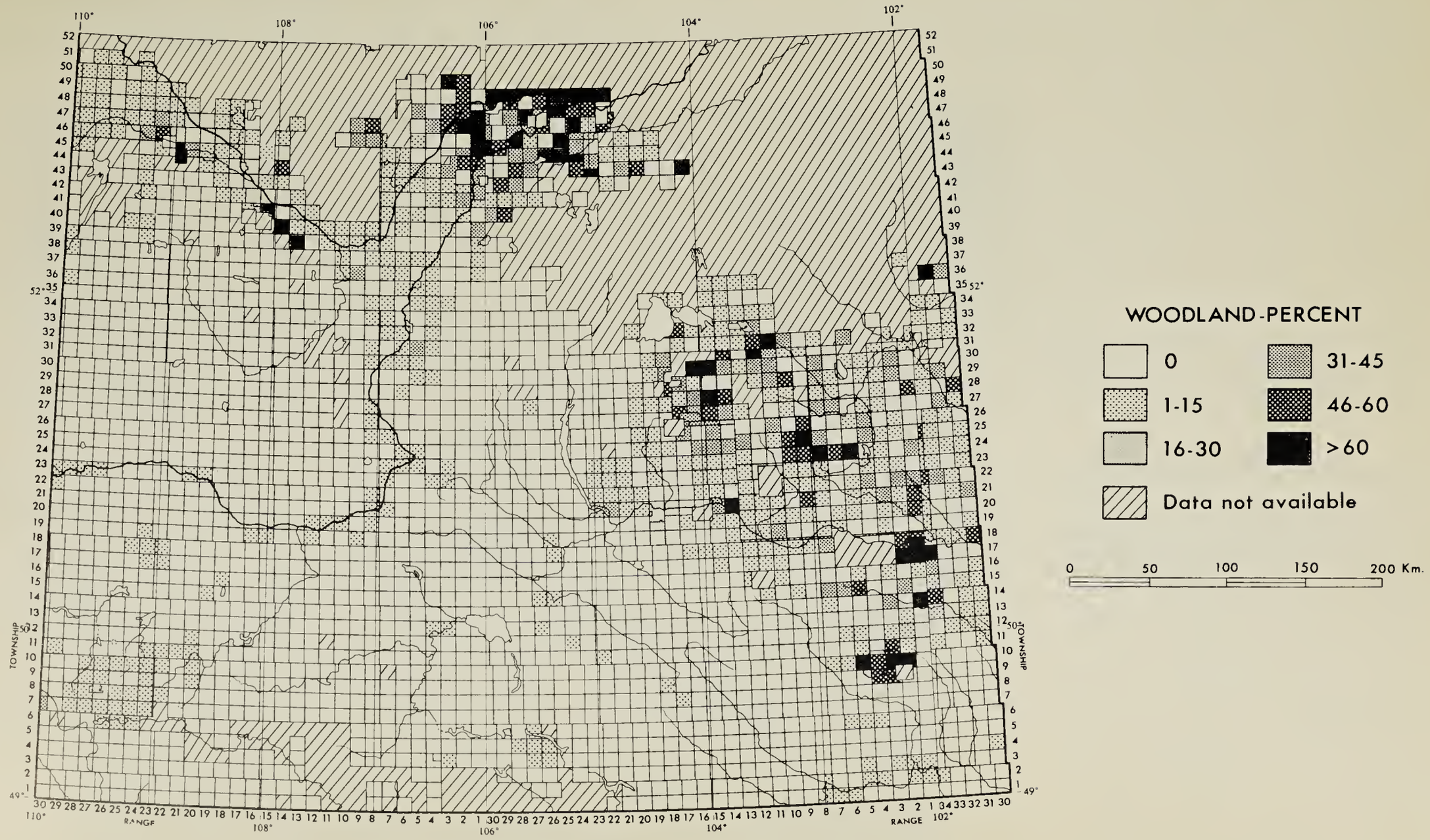

Figure 1. *Woodland - Percent, reconstructed from Dominion Land Survey plates of the 1880s. Reproduced by permission from Archibold and Wilson,* Can. J. Botany *58:2035.*

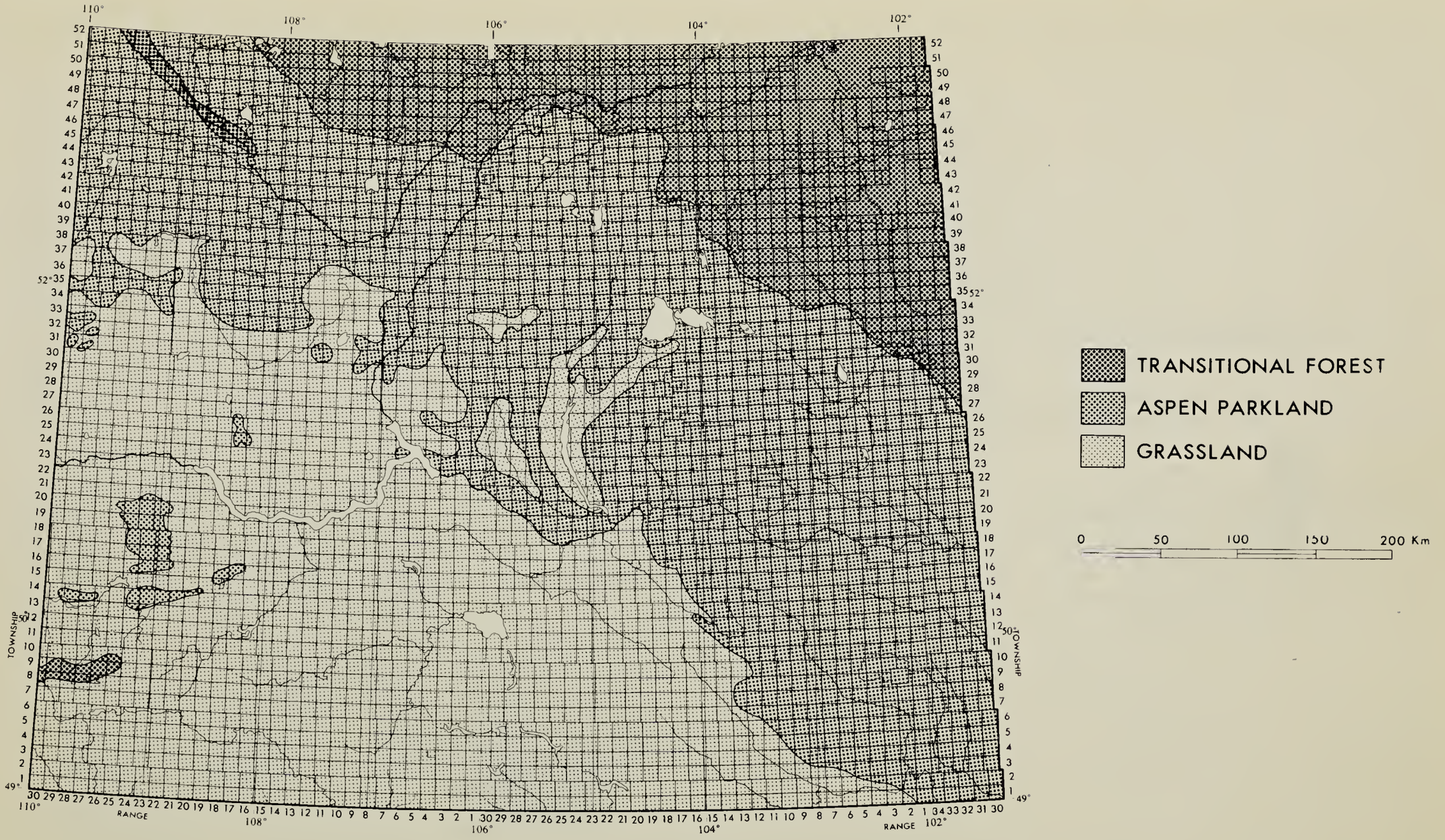

Figure 2. *Modern vegetation zones of southern Saskatchewan after J. B. Millar and S. C. Zoltai. Reproduced by permission from Archibold and Wilson,* Can. J. Botany *58:2041.*

Ernest Thompson Seton arrived at Carberry, Manitoba in 1882 when settlement was first beginning. He was fascinated by the recovery potential of aspen after a couple of years without fires: "If a piece of the prairie, almost anywhere, be protected for two consecutive years it will be found covered with a growth of poplars and willows."[37] While visiting Seton from England, Robert Miller Christy became interested in the prairie and later wrote a long article entitled "Why are the prairies treeless?" In it, he noted that "growth is slow and destruction by fire is swift . . . from what I have seen and heard, I imagine that by far the larger portion of the whole area of the prairies gets burned over annually . . . trees still grow on the prairies on spots that are to some extent protected from the fires; and that, over large portions of the prairies, young trees spring up annually, only to be at once burned . . . These trees have great vitality in their roots, and repeatedly send up fresh shoots after the annual fires."[7]

Christy quoted a letter written by Robert Bell, then the director of the Geological Survey of Canada: "The rapidity with which some tracts between Prairie Portage and Fort Ellice were stated to have been converted from forest to prairie, is almost incredible." Regarding the area south of Fort Ellice, along the present Manitoba-Saskatchewan boundary, Bell added: "The aspens of that region burn much more readily than does the wood of the same tree in Ontario and Quebec, and the portions which escape total destruction by fire rot and disappear in the course of one or two years."[7]

With the coming of settlement, the frequency of range fires at first increased. Sparks from steam locomotives became a major hazard. While taking the train in July 1894 from Crane Lake Station, John Macoun noted that "the grass was so dry on the prairie that I noticed eight fires starting from the sparks from the engine before we reached Swift Current."[28] In 1893, one fire extended northeastward from Yellow Grass Marsh for 100 miles and measured 15 miles across. In July 1894, another fire started near Swift Current and swept southeastwards over an area estimated at 6,000 square miles.[32] Natural causes of fire, especially lightning, continued as a threat.[34] Somewhat paradoxically, the dry sandhills offered some protection from fire and trees thrived in sand south of Carberry and near the present site of Elbow.[28 37]

As land was ploughed and as road allowances began to be graded, the risk of extensive fires diminished. Farmers who made furrows up the road allowance as fire guards were relieved of a portion of their taxes. Nevertheless it was not until the 1910s and 1920s that the aspen roots, present throughout the present parkland area, had a chance to grow. Proof of this can be obtained by looking at the early photographs in any one of the many local history books published in recent years, noting everywhere the virtual absence of natural aspen bluffs or of planted shelter belts in the early part of the century, and the gradual appearance of trees thereafter. In regards to the reappearance of aspen, there is "no indication of continuing invasion of the grassland zone; the increasing prominence of aspen . . . is associated only with the interrupted growth of existing patches made possible by protection from fire."[9]

A consistent story has been obtained by interviews with old-timers. For example, in the Findlater-Dilke area, where there are now up to a dozen bluffs per quarter section (.65 km^2), there were few trees near the turn of the century. When Charles Edwards settled in the Arm River valley in 1887, there were a few small aspen bluffs, but these were soon destroyed by fires. When Lewis Jones arrived in 1906 his land was without trees, but occasional stumps

were encountered during ploughing. When Mark Young came in 1907, the only firewood he found was a few willows beside a slough. Henry McArton in 1907 had a few aspen in a nearby ravine. As late as 1950, Mrs. Anfinson could see a car coming from any direction, though within ten years the aspen "bluffs" were so tall and so thick that they impeded the view.

On the other side of Last Mountain Lake, at what Grant considered as the southwestern outreach of the Touchwood Hills, there were tall trees surviving on the high land known as "Last Mountain". To the north near Raymore, there were only a few small bluffs of burnt-over aspen when Charles Harris arrived in 1909.

Similarly, at Fielding, 70 km northwest of Saskatoon, Henry C. Baker (interview of 18 May 1971) described the appearance of the land when he arrived in 1912: "There were no trees on farmland anywhere to impede the view or even to use for firewood. There were only willows, burned out many times. Although there were cottonwood and balsam poplar suitable for lumber along the north bank of the North Saskatchewan River, we had to cross to the southwest bank in winter to get firewood, for only there were the slopes well-treed with aspen."

The Swainson's Hawk at this time was a common buteo on the open prairie, and the Ferruginous Hawk then nested as far north as Carlton, Quill Lakes and Yorkton. All evidence points to the Red-tailed Hawk being rare on the open plains, even in migration, until about 1920. Although a few of the pale Krider's subspecies might then be seen as far north as Wakaw Lake, and Lake Lenore, the Red-tail was a regular

Immature Red-tailed Hawk. *K. Morck*

breeding species only in areas to the north of the plains, such as along the North Saskatchewan River, where trees grew to a substantial size.[8 29] At Carlton, for example, Blakiston and Bourgeau found Swainson's Hawk to be "abundant" in 1858, but located only a single Red-tail nest. Similarly, Loring at nearby Wingard listed the Swainson's Hawk as "common and breeding" in 1895, but failed to list the Red-tail.[24] Farther east, at Prince Albert and St. Louis, Eugene Coubeaux in 1897 and Russell Congdon in 1902 found Red-tail nests to be more common; Congdon found 2 nests "placed near the top of tall trees growing only a few feet from the shore" of Wakaw Lake. Ernest Thompson Seton found the Red-tail "abundant" in the wooded Duck Mountains near present Runnymede in 1884,[42] and it outnumbered the Swainson's Hawk near Raymore in 1909 (Charles Harris, pers. comm.) yet as late as 1924, H. H. Mitchell listed the Red-tail as "only fairly common, as observed through the south, Moose Mountain to Big River, ranging more sparingly northward."[29]

The unpublished records of early oologists confirm this distribution pattern. Only in heavily wooded areas of adjacent provinces, such as A. D. Henderson's haunts at Belvedere, Alberta and E. S. Norman's at Kalevala, Manitoba, were Red-tailed Hawk eggs collected regularly. In Saskatchewan, only 3 clutches are known to have been collected by oologists prior to 1900: William Spreadborough took one set of 3 eggs from a nest in a dead poplar near Indian Head on 31 May 1892 and Edward Arnold took sets at the Fishing Lakes near Fort Qu'Appelle on 8 June 1896 and 7 June 1898. Ferruginous Hawk nests then were easy to find, but North Dakota oologists such as George Withey had to make long excursions into the wooded portions of the Turtle Mountains or north to the Moose Mountains to collect a few treasured eggs of the Red-tailed Hawk.

The Red-tailed Hawk was absent from the long lists of bird migration dates such as those kept by all four reporters of the Territorial Natural History Society from 1903 to 1909. Three of these observers were in or near the Qu'Appelle River valley: R. H. Carter at Muscow, George Lang at Indian Head and E. W. H. Trood at Cotham post office south of Dubuc; the fourth was Laurence B. Potter of Eastend. Of 191 raptor migration dates for 12 species, led by 39 dates for the Marsh Hawk, 36 for the American Kestrel and 29 for the Swainson's Hawk, there were no records for two of the most easily identified and most conspicuous migrants today, the Bald Eagle and the Red-tailed Hawk. Will C. Colt at Osler in 1893 had no listing for this species and, in a lifetime of reporting migration dates to the Biological Survey in Washington, D.C., Mrs. Esther Cates of McLean had no entries for the Red-tail.[18 23]

As late as 1932, a Carnegie Museum collecting trip to the Elbow-Davidson-Imperial area, staffed by W. E. Clyde Todd, George Miksch Sutton and Albert C. Lloyd, failed in six weeks of intensive study to see a single Red-tailed Hawk.[44 45] On the other hand, when C. G. Harrold made a 34-day collecting trip to Old Wives and Last Mountain Lakes in 1922, he found a remarkable scarcity of buteos, with a single sighting each of a Swainson's and a Ferruginous Hawk, yet he found a Red-tailed Hawk nest with one egg, 6 feet from the ground in a poplar, on 14 May.[13]

As aspen bluffs became more numerous and more mature, with larger and taller trees, Red-tailed Hawks began a gradual increase. In wooded coulees of the Qu'Appelle valley west of Fort Qu'Appelle, R. H. Carter first described the Red-tail as "rare," but beginning in 1923 he was able to band young in one to three nests during most years in the 1920s.[15 16 17] It was not until 1929 that George Lang listed the Red-tail in his migration dates with the

notation "moderately common" and by 1937 as "common" in migration.[20] It was not until the late 1920s that H. H. Pittman could observe that the Wauchope-Redvers area of southern Saskatchewan was "rapidly becoming covered with little groups of trees or bluffs, and in these the Crows nest plentifully".[31] Pittman made his first notation concerning Red-tailed Hawks in 1951 and found his first nest in 1955.[19]

In the late 1930s, J. H. Taylor recorded a nesting pair of Red-tails in the Wascana Creek valley north of Regina, but it was not until 1956 that the first nest was found at Buffalo Pound Lake north of Moose Jaw.[3] [25] At Bladworth, P. Lawrence Beckie found his first Red-tail nest ever in 1958, and had three pairs nesting in 1959 (pers comm.). At Dilke, J. Boswell Belcher reported the first nesting pairs about 1960 (letter of 16 July 1971). In the coulees of the South Saskatchewan River north of Main Centre, George Harder had the first resident pair on his ranch in 1968, and a pair nested in 1976, 1977 and 1978 (pers. comm.).

All available evidence indicates that the Red-tail has only recently become a breeding species in the East Block of the Cypress Hills. The resident naturalists of the hills, Laurence B. Potter, Spencer Pearse, Charles F. Holmes and Steve A. Mann, all failed to find evidence of nesting; Potter had three sightings in the fall of 1924 but listed it as "rare, not breeding."[21] J. Dewey Soper's unpublished field notes listed a pair of Red-tails on Lower Battle Creek 18-20 June 1942 and W. Earl Godfrey saw one individual near Cypress Hills Provincial Park on 2 July 1948.[38] [11] The first nesting records are for 13 June 1976 at Ravenscrag Butte (three young banded by Lynn Oliphant, P. Thompson and R. Rafuse) and 21 June 1977, a nest with three young at "Jones Peak" west of Eastend (Michael A. Gollop, letter of 31 March 1983). Gollop feels that there might now be five pairs in the rather inaccessible treed coulees within 15 km of Eastend.

South Saskatchewan River. *Blake Maybank*

While there is little doubt of the spread of the Red-tailed Hawk in southern Saskatchewan, numerical data to measure the extent of the increase are difficult to obtain. At Carlton in 1939, Farley Mowat recorded 42 sightings of Swainson's Hawk, 37 of Red-tailed Hawk and 17 of Ferruginous Hawks, while in 1956 Houston sighted only 2 Swainson's, 33 Red-tailed Hawks and no Ferruginous Hawks.[30] [24] At Yorkton, where in Houston's boyhood the Swainson's Hawk was the dominant buteo south of the city around the Rousay Lakes, Rokeby Marsh and Crescent Marsh areas where he worked for Ducks Unlimited, Adam Schmidt's survey of 1973 in the same area located 11 Red-tailed Hawk nests but only a single Swainson's Hawk nest.[36] Near Naicam, where the Swainson's Hawk actually increased to become the commonest buteo by the early 1940s, there was complete replacement by Red-tailed Hawks 20 years later (W. Yanchinski, pers. comm., 11 August 1971). Near Indian Head, the Red-tailed Hawk had replaced the Swainson's Hawk by 1969 when R. Lorne Scott banded 69 Red-tailed nestlings. Today, in good parkland habitat near Yellow Creek, nesting Red-tails average about one pair per square mile (2.6 km^2) (Houston, unpublished data). In migration, Red-tailed Hawks appear to have increased greatly and in recent years from 500 to 2,500 have been counted flying over Indian Head during the peak day of spring migration.[6]

It seems probable that an ability to occupy edge habitats, and aggressive behaviour towards other buteos on the open side of the habitat gradient from forest to treeless prairie, has pre-adapted the Red-tailed Hawk for the semi-open tree-grassland mosaic that has developed with the cessation of range fires. It is "an extremely adaptable raptor, capable of efficiently utilizing a wide variety of habitat types."[26] A further extension of range of the Red-tail is not expected for as more and more aspen trees are bulldozed, we predict that the Red-tail will instead begin to decline. There is evidence that Red-tailed Hawk numbers may in fact have peaked about 1970 and that a decided decline may have already occurred in the Indian Head area (Lorne Scott, pers. comm.).[6]

The timing of the Red-tailed Hawk range expansion was similar to but slightly later than that of the Western Kingbird, though the latter species moved in from the south and west, not from the north and east. The Western Kingbird colonized the plains when trees reached a height of 6 or 7 m, a process that took about 20 years.[22] Since the Red-tailed Hawk requires trees with a height of about 10 m, its expansion took somewhat longer, in the neighborhood of 30 years.

There are questions concerning the spread of the Red-tailed Hawk that remain unanswered. It is difficult, for example, to explain the near-total absence of migration records from the open plains before the 1920s. In the absence of suitable trees and especially before

Nestling Red-tailed Hawks and Richardson's Ground Squirrels. *K. Morck*

telephone poles became widespread, did the Red-tailed Hawks simply fly high over — or around — the open plains? Did they fly so high that they could not be identified? Although the Red-tailed Hawk is now considered by birders as one of the easiest hawks to identify, showings its name when the sun shines on its distinctively coloured tail, it was nevertheless misidentified as a Rough-legged Hawk, by a few oologists. Such errors must be taken into account, but by no means destroy the general conclusion of this paper, for one of us has personally observed the spread and increase of the Red-tailed Hawk over 40 years, paralleling the increase in the number and size of aspen bluffs on the prairie.

Acknowledgements

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CALGARY AREA BLUEBIRD TRAILS — 1982

DON STILES, 20 Lake Wapta Rise SE, Calgary, Alberta. T2J 2M9

This is the fourth year in which members of the Calgary Field Naturalists' Society have been monitoring Harold Pinel's Calgary Bluebird Trail. Since Harold Pinel's trail has been further modified each year with observers adding side loops and dropping House Sparrow-prone sections of trail, it was decided to group the Calgary area trails by direction from Calgary — Southwest, Northwest and Northeast. This allows new sections to be added to trails without increasing the number of columns in the tables of results. This year three new sections of trail were added, two in the southwest and one in the northwest. This brings the total number of sections of trail to 13 with most observers handling from 15 to 55 houses. The exceptions are Blake Stillings with 312 houses and the northeast section (previously Andrew Stiles - Didsbury) with 119 houses. These two sections have been retained in the tables along with Nancy Murray's Seebe-Canmore section, so that these can be compared directly with previous years' results.

Statistics indicate that bluebird numbers were similar to last year with some sections up and others nearly equal or down. Several of the observers reported dead bluebird and Tree Swallow young in the nest. Young were usually of the same size, indicating an event such as a storm was the cause. Kay Morck reported 3 dead adult Tree Swallows in a single box west of Hartell on 1 June. This was after the heavy snow storm of 28 May, suggesting that they had starved or suffocated.

Vandalism was more severe than usual with 3 sections of trail being hit. Linda Vanneste recorded 14 instances with 2 boxes stolen, 3 smashed, 2 shot up and 1 burned. Others were filled with rocks or beer cans. When Linda replaced a stolen box, it too was stolen and a note left thanking her for the box! Fortunately vandalism strikes only occasionally. Suggested solutions were public education and putting a logo and phone number on the boxes.

Highlights

Don Stiles reported a double brood of Tree Swallows in one nest that fledged 12 young (see *Blue Jay*, December 1982, 40(4):205). Betty Haines found four young bluebirds with no parents after the cat caught the male and the female disappeared. Blake Stillings placed the young with four others in a nestbox and all eight fledged.

One case of a grassland species of sparrow using a nest box was reported by Laurie Meijer-Drees who found 4 brown-speckled eggs in a bluebird-type nest on 30 May. The birds was seen only briefly; possible identification was Clay-colored Sparrow. No young hatched.

Blake Stillings reported an unsuccessful Boreal Chickadee nest. Nancy Murray found a Mountain Chickadee in one of her houses.

This is the second year of the Seebe - Canmore trail. As in most trails more birds tend to find the houses in the second year. Bluebirds increased from 2 to 3 nests and Tree Swallows from 2 to 5. A large number of the 39 houses are unused due to the absence of grassland along the trail.

Table 1. CALGARY AREA NESTBOX RESULTS — 1982.

Trail	*Southwest*	*Blake Stillings*	*Northwest*	*Northeast*	*Seebe-Canmore*	*Totals*
No. Boxes	170	312	125	119	39	765
Miles of line	111	140	84	65	21	421
Mountain Bluebird						
No. Nests	40	82	42	33	3	200
% Successful	90	91	76	70	67	84
No. Eggs	206	448	209	187	17	1067
No. Young Fledged	150	407	157	115	11	840
Clutch Size	5.15	5.46	4.98	5.67	5.67	5.33
Y/Successful N	4.17	5.43	4.90	5.0	5.5	5.0
Banded	12		50	74		136
Tree Swallow						
No. Nests	114	205	83	70	5	477
% Successful	90	92	83	76	60	87
No. Eggs	540+	1032+	439	390	23	2424+
No. Young Fledged	455+	949	333	278	14	2029+
Clutch Size	4.74+	5.03+	5.23	5.57	4.6	5.08+
Y/Successful N	4.42+	5.05	3.38	5.25	4.67	4.88+
Banded	18		37	142		197
House Sparrow	4	14	5	18	1	42
House Wren	7	1	2	6	0	16
Multiple Use	6	7+	10	18	1	42+
Vandalism	20	10	5+	4	0	39
Boxes Not Used	11	5	1	7	31	55

George Blundun was attacked by adult bluebirds when he checked a nest with 5 young just ready to fledge.

Bob Krahulic reported a late Tree Swallow nest near Priddis. The first nest, already late, fell down when the young were feathered (late July). A second attempt fledged young about 26 August.

House Sparrow Predation

Blake Stillings mentioned two cases of persistent House Sparrows. Last year on the Horse Creek Road he removed House Sparrow nests three times from one box. This year he moved the box one-half mile to a side road. It still had House Sparrows, so he moved it again. There were Tree Swallows around and they used the box. About 10 days later there were 2 dead Tree Swallows in the nest, the victims of House Sparrow predation. In the second case west of Cremona two houses near each other had bluebirds in one and sparrows in the other. When the House Sparrow box was removed they took over the bluebird nest.

Don Stiles noted an area with dead adult bluebirds and swallows in the nests with heads pecked, an obvious sign of House Sparrow predation. It was first noticed in that area last year although the previous 4 years there had been no House Sparrows.

The use of plexiglass roofs which let light in is supposed to discourage sparrows. Six houses with 2" x 3" squares of plexiglass in the roof were placed on the sparrow-prone section of the East Didsbury section of trail. Two were still used by House Sparrows. A similar experiment with 2.5" circles

Mountain Bluebird. *Juhachi Asai*

produced similar results — some House Sparrows still used the boxes. Further experimentation will be done using roofs entirely of plexiglass.

Don Grussing of Minnesota stated in his book "How to Control House Sparrows" (published by Roseville Publishing House, P.O. Box 8083, Roseville, Minnesota 55113) that the male has more attachment to his territory than even to his mate. He will stick with a house he has chosen even if he loses his mate, and waits for another female. This suggests that houses infested with House Sparrows must be completely removed from the territory.

Table 2. RESULTS OF LATE MONITORING

Species	*Active*	*Young Fledged/ Inactive Now*	*Dead Birds*	*Total*	*% Active*
Tree Swallow	10	43	3	56	17.9
Mountain Bluebird	3	14	1	18	16.7
House Wren	2	2		4	50.0
House Sparrow	2	3		5	40.0
Unused				5	
Total	17	62	4	88	19.3

Table 3. NESTS WITH EGGS ONLY AT LAST MONITORING

Date	Mountain Bluebirds No. Nests with Eggs	Total Nests	%	Tree Swallows No. Nests with Eggs	Total Nests	%
1979 - 30 June, 1 July	1	19	5.3	14	77	18.2
1980 - 29 June	2	30	6.7	15	69	21.7
1981 - 28 June	5	32	15.6	15	68	22.1
1982 - 1 July	3	33	9.1	8	70	11.4
Total	11	114	9.6	52	284	18.3

Late Monitoring

Other years our last monitoring about the first week in July recorded late bluebird and swallow nests with only eggs in them. This year Dan Cloutier and his sister Carmen monitored 88 houses on the East Didsbury trail on 18 and 20 July. Three nests had dead Tree Swallow young and one had a dead adult bluebird. Other results are in Table 2.

Dan also cleaned inactive nests at this time. Although there is a strong ammonia smell in the nest just after fledging, making this an unpleasant task, cleaning them at this time will shorten the time for the final check before next year's nesting season.

Table 3 compares late nesting in the last four years. These figures give a rough idea of the percentage of nests for which results could be recorded by late monitoring.

Banding

Banding efforts were increased this year with Don and Philip Stiles on the East Didsbury trail, Ray Woods in the Elkton area, Laurie Meijer-Drees on the Sundre loop and Don Stiles west of Dewinton. Final totals were 136 Mountain Bluebirds and 236 Tree Swallows banded.

Band recoveries were up over last year. Of interest were two Tree Swallows banded by Harold Pinel in 1977 in the East Didsbury trail, Ray Woods in the recaptured previously as follows:

880-98835 — Banded as an adult, 1977, in house H179. Recaptured 1980 3 mi nne in A8. Recovered 13 June 1982 6.5 mi e in A37A dead due to sparrow predation. This bird was at least 6 years old.

850-98849 — Banded as a young in H390. Recaptured 1978 9 mi ne in A71. Recaptured 1979 2 mi s in A143. Recaptured 1 July 1982 2.5 mi ese in A-S1. This bird is still active at 5 years age and with its mate fledged 4 young this season.

In addition 4 Tree Swallows banded in 1981 were recaptured. Three were banded as adults and were recovered 1 mi, 3 mi and 0.5 mi from their banding sites. The fourth band was from a young banded 2 mi from the box in which the band was found. There was no trace of the bird and the band was in the bottom of the box. House Sparrow predation is assumed. The 3 adults were among 26 banded in 1981 for a 11.5% recovery; the single young was one of 69 young banded for a 1.4% recovery.

Finally one female bluebird banded in 1981 was found dead in the same box that she nested in last year.

FIRST RECORD OF THE BAND-TAILED PIGEON IN MANITOBA

WILLIAM J. WALLEY, 19 Edgar Avenue, Dauphin, Manitoba. R7N 0R4

On 15 April 1982 Jim Crozier of Dauphin, Manitoba identified a Band-tailed Pigeon in the yard at his farm (NW33-23-19-W1) located approximately 1.3 km northwest of the north entrance (Hwy. 10) to Riding Mountain National Park. The following day, identification was confirmed by T. Jenkins and later in the day by W. Clark and me. Several photographs of the bird were obtained at close range.

Field marks of the bird were observed at a distance of 40 m with a 20x spotting scope, then at 10-12 metres with 7x35 binoculars with the pigeon perched about 7 m up in a Bur Oak (*Quercus macrocarpa*). The bird was larger than our local Rock Dove. The under parts from the belly into the head were beige. The wings and back were grey. The bill was yellow with a black tip (the distal quarter). A narrow, but prominent white band occurred on the back of the neck with a green patch below this band which extended downward to the upper back. As the tail was held in a more-or-less horizontal plane when the bird was perched, the grey band through it was seen only when short flights were made. Yellow feet and a red eye ring completed the colour characteristics of the visitor. Rock Doves were not observed in the area.

Bent mentioned that in the states of Washington and California, Band-tailed Pigeons are associated with oaks in gulches where they feed on acorns, berries, etc.[1] At Crozier's, the pigeon stayed at the crest of a deep ravine in a semi-open stand of Bur Oak and other hardwood deciduous trees. In the ensuing days, Crozier reported that the pigeon was feeding on acorns which had fallen to the ground, swallowing them whole. Although the bird had been in the yard only since the previous day, it had already established two favorite perches as observed by Mr. Crozier. Both were less than 20 m from the house.

As I moved in to photograph it, the pigeon did not become fidgety until I was about 10 m away from the tree in which it was perched and when it flew, it was only a short distance to a nearby tree. Its tameness suggested that it may have been a caged bird that had escaped, but it was not banded. Alarm was displayed (extreme fidgeting) when a large hawk circled over the yard high up. Bent points out that Band-tailed Pigeons are preyed upon by Prairie Falcons and Cooper's Hawks.[1] Mr. Crozier heard cooing sounds from the bird prior to our arrival. The pigeon was last seen at the Crozier farm yard on 27 April where it continued to feed on acorns, however, it apparently left shortly after that date.

According to Godfrey, the Band-tailed Pigeon's breeding range is from southern British Columbia, including Vancouver Island, Utah, and north-central Colorado south to Baja, California and through the mountains of Mexico into Central America.[4] He notes that it winters from southwestern United States (sometimes north to B.C.) southward. Robbins et al note its locally common status, especially in summer and its association with western oak and pine woods.[8]

Houston lists three hypothetical records (no material evidence) for Sask-

Band-tailed Pigeon. *W. J. Walley*

atchewan and Weidl reports a fourth record for that province that Dr. Houston would also classify as hypothetical because of the failure to obtain material evidence.[6 9] In Manitoba, no records are given in recent regional publications by Gardner, Cleveland *et al* or by Knapton.[3 2 7] According to Hatch, this sighting is the first record for Manitoba.[5] He notes, however, that a second sighting was made in Manitoba in 1982 when one was identified at Churchill in June.

Acknowledgements

The author is grateful to Garth Ball of the Manitoba Department of Natural Resources for furnishing a copy of Bent's article on the Band-tailed Pigeon. Appreciation is also extended to David Hatch for verifying the record as the first in Manitoba and for informing me about the Churchill record.

[1] BENT, A. C. 1932. Life histories of North American gallinaceous birds. Dover publications New York. (1963 reprint)

[2] CLEVELAND, N. J., C. W. CUTHBERT, G. D. GRIEEF, G. E. HOLLAND, P. A. HORCH, R. W. KNAPTON, R. F. KOES, N. F. MURDOCH, W. P. NEILY, and I. A. WARD. 1980. Birder's guide to southeastern Manitoba. Eco Series No. 1. Manitoba Naturalists Society, Winnipeg. 58 pp.

[3] GARDNER, K. A. 1981. Birds of Oak Hammock marsh wildlife management area. Wildlife Branch, Manitoba Dept. of Natural Resources. 172 pp.

[4] GODFREY, W. E. 1966. The birds of Canada. Natl. Mus. Can. No. 203. Biol. Series No. 73. Ottawa. 428 pp.

[5] HATCH, DAVID. March 11, 1983. Chickadee Notes. Winnipeg Free Press.

[6] HOUSTON, C. S., M. I. HOUSTON, and J. B. GOLLOP. 1981. Saskatchewan bird species — hypothetical and rejected. Blue Jay 39(4):196-201.

[7] KNAPTON, R. W. 1979. Birds of the Gainsborough - Lyleton Region (Saskatchewan and Manitoba). Special Publication No. 10. Saskatchewan Natural History Society. Regina 72 pp.

[8] ROBBINS, C. S., B. BRUUN, and H. S. ZIM. 1966. Birds of North America. Golden Press. New York. 340 pp.

[9] WEIDL, D. A. 1982. Band-tailed Pigeon near Herbert, Saskatchewan. Blue Jay 40(3):169-170.

MEMORIES OF GROUSE

JERROLD ARMSTRONG, Box 433, Kinistino, Saskatchewan. S0J 1H0

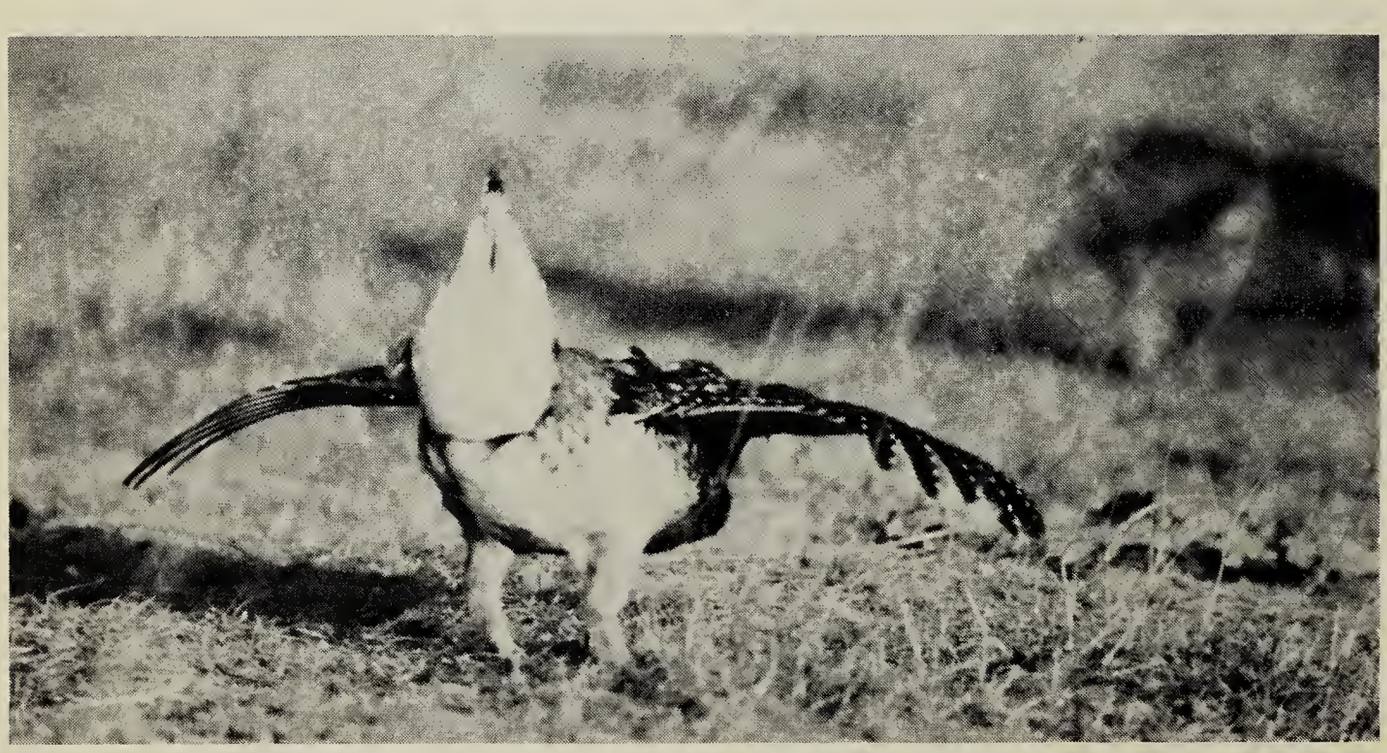
One spring in the 1930s, I was walking in the country 1 or 2 miles west of Melville, after a sleepless night. It was very early in the morning — before sunrise. Suddenly I became aware of something in the distance, a faint gabble of sound. I listened intently, then began walking toward it.

The sun was just beginning to appear above the horizon behind me. The air was cool and still. The country was fairly open with scattered poplar groves — the pasture land of the "west herd" of milk cows. Melville was, I believe, unique in having an "east herd" and a "west herd", each cow belonging to an individual family in the town. [In the morning the cows were driven out to their respective grazing land and in the evening they returned of their own accord, each to its own home stable.]

As I walked on slowly and silently, the source of the ever-louder cackling, rattling sound came into sight: a large flock of Sharp-tailed Grouse engaged in the courtship behaviour I had read about but had never seen. I continued my cautious approach, step by step, expecting them to spot me and take off at any moment. I was in plain sight; there wasn't a tree or bush within 100 yards. Nearer and nearer I moved in growing amazement that these wild birds were ignoring me. They were in a scattered crowd, so to speak, in an area as I recall about 50 yards wide and 100 yards long. The cocks were displaying and feigning combat; they seemed to be unconcerned, indifferent.

When I was about 40 feet from them, the flock suddenly stopped its noisy activity, froze for a second, then exploded in a crashing flurry of wings and was gone!

I was amazed at the whole thing — the strange behaviour of the flock in allowing me to approach so near — until the explanation occurred to me. They



Sharp-tailed Grouse. *Gary W. Seib*

had not *heard* me because of my cautious silent tread; they had not *seen* me because the sun rising over the horizon was directly behind me. I was invisible in a blaze of light.

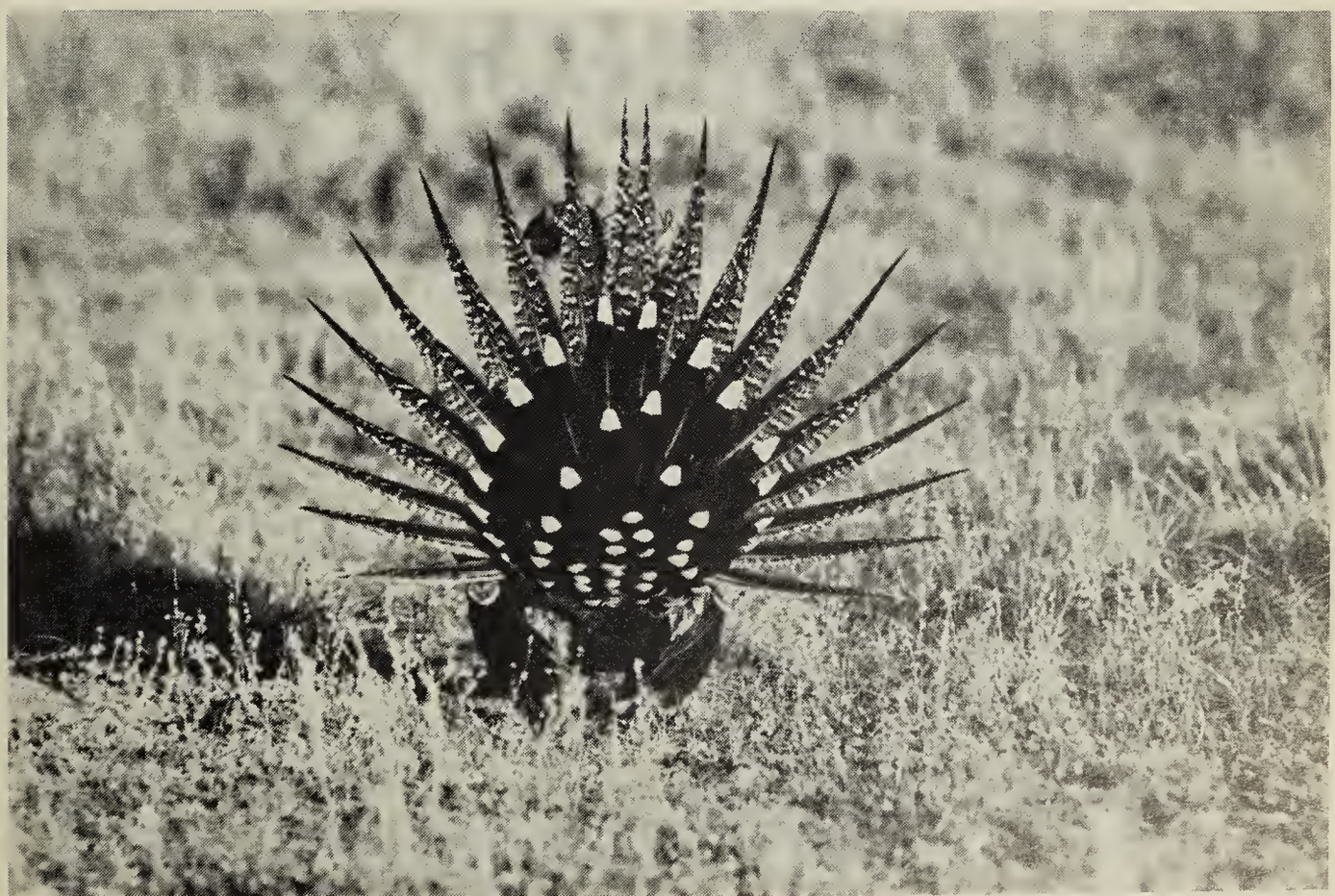
I had somewhat similar experience in southwestern Saskatchewan, in the "Whitemud" or Frenchman River valley only a few miles north of the United States boundary. On this occasion, on horseback, I came even closer to a similar courtship ceremonial of Sage Grouse. Their ritual struck me as being more "orderly." The hens huddled together in the center of a circle with a radius of 30 to 40 feet. Around the circumference the cocks strutted and displayed with dignity, spreading their pointed tail quills into fans, puffing out their white breasts and inflating and deflating their orange-coloured throat air-sacs with a sound something like the pop of a cork being jerked out of a bottle.

I rode in a sidling slant toward the flock and stopped about 30 feet from their arena. They paid no attention to me. To them, horses were of no significance, and this rider-and-horse was just — a horse.

In my experience no game birds are so adept as the Sage Grouse at hiding — disappearing — in open country with nothing but sparse tufts of cover. They allow you to walk right up and almost tread upon them, then scare the wits out of you as they burst up from the ground at your very feet.

In the Kinistino country in the 1920s, it was a way of the Greater Prairie Chicken, numerous then, early on frosty winter mornings to gather in little groups on top of straw stacks and converse.

I haven't seen a Greater Prairie Chicken or a Sage Grouse for many years. I wonder how they are faring?



Sage Grouse. *Stan Shadick*

A NEW VIEW

BRADLEY MUIR, Waskesiu Lake, Saskatchewan. S0J 2Y0

It was my first trip to the home farm in nearly a year and soon after pulling onto the gravel road I knew something had changed on the prairie landscape. What was different about those former grasslands now swapped for wheat fields?

Another look. I finally recognized the changes. In the past, on hundreds of trips "down the tracks" (the municipal grid parallels the CNR line), I could have seen telephone lines along the roadside. The poles and lines were taken for granted as 'natural' perches for the prairie birds which were the primary object of my attention.

Now gone were the sagging wires and weather worn spruce poles with their T-crossbars and blue, glass insulators, and as I drove along I began to miss the frequent and obvious company of birds once drawn to the road allowance and the man-made perches. Blackbirds, swallows, shrikes, bluebirds, meadowlarks, hawks, owls, and many more. They had been so numerous, so visible. The first place to look for a bird when on a trip by car was the roadside telephone lines. There birds perched for a preliminary survey before pursuing their prey, to announce their presence orally or, I imagine, to save some wing beats while enjoying the view across the plain.

I would count them in mile stretches. Raptors on the main poles, meadowlarks on the cross-bars and swallows uniformly spaced along the wire strands.

To imagine what the sweeping grasslands looked like a hundred years ago one would have to look *through* the telephone and power lines and shelter belts. But, having grown up with them, these roadside elements were part of the familiar scene. Now that the lines had disappeared, birds were far less obvious, as they dipped into the fields or ditch, grass or shrubs.

Our farm is near Colfax, Saskatchewan and lies in the heart of glacial lake Regina. The 55-mile drive from the city of Regina crosses some of the most featureless land in the province. It is an area congruent with the stereotyped

Western Kingbird. *Fred W. Lahrman*

image of the province. Miles of golden wheatland, dusty gravel roads, a dying small town every 6 miles with its attendant grain elevators and telephone party lines silhouetted in the setting sun.

In the past 5 years SaskTel has been working on its Rural Service Improvement Program (R.S.I.P.). The program has meant the removal of 57 thousand km of aerial open-wire lines (SaskTel Public Affairs, pers. comm.). Replacement with buried cable has been made in virtually every community in the province. It is a noticeable visual change, especially in areas like our farmstead which are gently undulating, and treeless (except for shelter belts) with willow shrubs on marsh edges. The difference is compounded by the birds being far less obvious. They are still around, spending more time in the grass and fields, on the road grade, near a marsh or soaring too high to be seen on a sunny, eye-squinting day. Locals say that there seems to be more birds occupying the poplars and carragana of the windbreaks. Birds are relocating to new perches and roosts or landing on the ground rather than telephone lines after a short interlude in the 10,000 years since the last ice-sheet melted and their ancestors recolonized the land.

Some birds may have increased their range, in part due to the tree-like perches of telephone poles. Common flickers for example extended their range from treed coulees to the grasslands. Two sources of mortality may have been reduced by the switch to underground lines. Fewer birds in flight may collide with the wire strands and fewer road-kills may occur as the "perch-magnet" has been removed.

Telephone lines went up over 50 years ago and now they have come down. The view is different across much of the Saskatchewan plain. Chalk up another alteration to this landscape, one that this time restores a fraction of the pre-pioneer character to the prairie.

MERGANSER NEST IN CHIMNEY

TONY CAPUSTEN, 1139 River Street W., Prince Albert, Saskatchewan. S6V 3A2

On 11 May 1982 a Common Merganser had 8 eggs in a nest in a chimney. This chimney was built on a bracket. There was a pipe opening about 6 feet from the top.

On 18 May there were 11 eggs. On 23 June three young were seen in a nearby meadow. Two eggs failed to hatch; one was addled. The duck flew around, calling. The young had to cross a busy road about 100 yards down the slope and then another 100 yards to the edge of Emma Lake.

Identifcation of the adult was based on observation from a couple of feet away while the duck was incubating — serrated beak shape, rufous crest, white throat patch, rufous neck, white breast.[1] [2] Observation was also made when the duck left to feed. It would leave about 10 a.m., usually to feed for about 2 hours.

[1] GODFREY, W. E. 1966. The birds of Canada. Nat. Mus. Can., Bull. No. 203, Biol. Ser. No. 73. Queen's Printer, Ottawa.

[2] PETERSON, R. T. 1941. A field guide to western birds. Houghton Mifflin Co., Boston, Mass.

Merganser nest in chimney.
Tony Capusten

GOSHAWK - SNOWSHOE HARE ENCOUNTER

KENT BRACE, R.R. 3, Saskatoon, Saskatchewan. S7K 3J6

On 15 January 1983, my wife, our two children and I observed a Goshawk pursue and kill a Snowshoe Hare. The dramatic encounter transpired in a strip of bush (willow, rose, Black Poplar, Chokecherry and Wolf Willow) located about 10 m from our Pike Lake, Saskatchewan, home.

One of the children noticed the Goshawk sitting in a tree just outside our kitchen window. During the next 45 to 60 minutes, the large accipiter harassed a Snowshoe Hare located in the thick understory below.

The bush, although only about 10 m wide, was too thick for the Goshawk to negotiate at high speeds. The hawk employed an interesting tactic with highly successful results. On four occasions the bird dropped down through the trees, landing a few feet from the hare. The Snowshoe responded by darting along inside the bush at full speed. The Hawk then pursued the hare, flying just over the tree tops. The hare ran about 20 to 30 m on each occasion and then stopped, remaining inside the bush. The hare ran back and forth, staying within a patch 50 to 60 m long. The hawk would perch over the hare, occasionally cocking its head to view its prey.

These vigorous pursuits, although short in duration, seemed to tax the hawk, as expelled air was visible following the chases. I am not certain how long the hunt had been in progress before we became aware of it. It was not possible to detect adverse effects to the hare, at least not as long as it remained in the bush. Finally the hare scurried out of the bush and attempted to cross a small clearing. The Goshawk pounced on it and killed it.

My wife feeds Snowshoe Hares at our back door. During extremely cold periods, up to five animals can be seen at dawn and dusk. We have seen a Goshawk hunting the narrow strip of bush on two other occasions since 15 January.

Goshawk. *R. E. Gehlert*

Piping Plover at Long Point. *G. Holroyd*

PIPING PLOVER — HOW MANY ARE LEFT?

No one knows. There may be 1,500 birds on the Atlantic coast but fewer than 100 on the Great Lakes. The prairie populations and coastal wintering areas have never been censused.

Piping Plovers are a shorebird species threatened throughout their North American range. Increased development of their specialized, unvegetated beach habitat may cause more populations to disappear, unnoticed.

In an effort to determine the current status and distribution of Piping Plovers, the World Wildlife Fund (Canada), Delta Waterfowl Research Station and Manitoba Department of Natural Resources are soliciting help in locating birds on breeding, migration or wintering areas. Please support this project by reporting past or present sightings of Piping Plovers (include date, location, number of birds and color bands, if any). Send information to: *Susan Haig, Delta Waterfowl Research Station, Portage la Prairie, Manitoba, Canada. R1N 3A1*

Piping Plover Nest, Manito Lake, Saskatchewan. *Eileen Graham*

FLY-BY-NIGHT

JUNE-ANN MUIR, Waskesiu Lake, Saskatchewan. S0J 2Y0

This past winter we had a surprise visitor at our bird feeder. Around 9 p.m. or later a most furry little creature would appear on the feeder just outside our window. At first we were not positive what he was but by looking in 'Mammals of Canada' (Banfield) we found him. The little animal was a Northern Flying Squirrel.

From our window we look out upon a spruce and aspen forest. This habitat is ideal for many birds and mammals. And with our feeder, which is no more than a foot away from the window, a great attraction sight, we have a unique observation post.

The nocturnal squirrel differs from its daytime cousin the Red Squirrel, in several interesting ways. It is grayish-brown with a dark brown stripe down both sides. Its head is much more oval than the Red Squirrel's and the eyes are very large and dark. The nose and lips are pink. It looks chubbier than it really is because of the folds of skin connecting the front wrists to his hind legs. These folds of fur-covered skin enable it to glide and that gives the animal its name. We noticed that the flying squirrel's small front feet are handlike and grasp objects as easily as do the Red Squirrel's front feet. The hind feet are long and allow him to assume an upright posture. The tail measures 5 to 6 inches in length and has extremely soft fur.

We saw the squirrel 'fly' only once. It leapt from the cedar wall of the building and glided to the base of a spruce tree about 30 feet away. We believe it reaches our second storey feeder by doing the reverse. It glides down from the top of a spruce tree, lands on the side wall and climbs to the feeder. Whenever it does arrive it prefers to eat sunflower seeds, suet (a favourite second) or birdseed.

Though we can usually hear the Red Squirrel chattering or scolding away, the Northern Flying Squirrel has always been silent.

Behavior differed with the weather. When temperatures were above −10°C and it was calm, it sat upright with its tail flattened on the feeder. When it was cold or windy it would be almost lying with tail held against its back. In temperatures colder than −20°C it must stay in its spruce tree hide-away and sleep for it never paid a visit on such cold nights.

One of the strangest behaviors, with this particular flying squirrel was that it allowed us to reach out the window and pet its back and tail. The fur of the squirrel was very difficult to feel, because our fingers are not sensitive enough to perceive the softness. The squirrel did not seem to be frightened of slow movements but any quick moves and it scurried away. The thrill of touching a 'wild' animal is almost unexplainable. The Northern Flying Squirrel is a mammal that is rarely seen. We were very fortunate that he came to our feeder and we treasure the moments he let us watch him.

Northern Flying Squirrel.
Hans Dommasch

JUNIOR NATURALISTS

DO YOU KNOW THESE WILD PLANTS?
. . . from the prairie . . .

1. Yellow

2. Purple

3. White

4. Blue

5. Greenish-white (flowers not shown)

6. Blue

. . . from the woodland . . .

7. *White*

8. *Yellow*

9. *Blue and white*

10. *White*

11. *White and pink; mat-forming shrub*

12. *White; low shrub*

1. *Golden Bean*	*Blake Maybank*	7. *Bunchberry*	*Anonymous*
2. *Ball Cactus*	*Wayne Lynch*	8. *Yellow Ladies' Slipper*	*Blake Maybank*
3. *Moss Phlox*	*Wayne Lynch*	9. *Blue Columbine*	*Ken Lumbis*
4. *Lewis' Wild Flax*	*Fred Lahrman*	10. *Starflower*	*Blake Maybank*
5. *Poison Ivy*	*Gary W. Seib*	11. *Bearberry*	*Gary W. Seib*
6. *Blue-eyed Grass*	*Sheila Lamont*	12. *Labrador Tea*	*Gary Anweiler*

NATURE LIBRARY

SASKATCHEWAN COUGAR — ELUSIVE CAT

TOM WHITE, 1982. Special Publication No. 14, Saskatchewan Natural History Society, Box 1121, Regina, Saskatchewan, S4P 3B4. 80 pp. Paper $5.00.

This publication, the first Special Publication of the Saskatchewan Natural History Society to concentrate on a single species, is of interest primarily for its preservation of records of Cougar sightings.

After a brief introduction, the Cougar, Bobcat and Lynx are described. Details on the Cougar's life history follow a description of the animal. Brief descriptions of the Bobcat and Lynx follow. This section would have benefited from a clearly marked comparision of the distinguishing characteristics of each in the field. This information is sometimes given in other sections. For example, the differences in locomotion are described later when dealing with assessing the validity of reports.

The problems of assessing reports, historical records of Cougars in the Americas, Cougar habitat and movements in Saskatchewan, and tracks and kills are then considered.

The remainder of the booklet deals with Saskatchewan Cougar records of specimens, tracks and sightings. The province has been divided into seven regions for which reports are listed. The reasons for dividing the area into these particular regions is not stated. The reports are numbered and represent 139 localities, with more than one report from over one-third of the localities. Lower case letters follow the numbers where more than one record is given for a locality. This section is the most valuable part of the book, since it preserves records that could easily have been lost or never have come to light. In some cases the reports are a direct quote of the person who made the observations, while in others they are paraphrased. The use of quotation marks would have clearly distinguished between the two.

A map shows the location of the reports by number. Where a number occurs more than once on the map (e.g. 131) with some distance between the points, a letter designation would have helped pinpoint the site of the specific report. Symbols with the numbers to indicate records of specimens, tracks or sightings would, I feel, have added considerably to the value of the map.

White is to be congratulated for tracking down and recording the numerous reports. They add immeasurably to our knowledge of the distribution of the Cougar. — Reviewed by *W. Harvey Beck*, Box 458, Gleichen, Alberta. T0J 1N0

WILD GREEN VEGETABLES OF CANADA

ADAM F. SZCZAWINSKI and N. J. TURNER. 1980. National Museum of Canada, Ottawa, Ontario. 179 pp. Coil bound $9.95.

Another in the well-received "Edible Wild Plants of Canada" series, this work maintains the format, quality and interest

of the previous volumes. Companion volumes have been reviewed in the *Blue Jay* Vol. 37 No. 2 (June 1979) and Vol. 37 No. 4 (December 1979).

The book is well-organized and researched, with preface, introduction, glossary and index set-off from the main body of the text through the use of different paper colour.

The introduction gives the nutritive value of some wild vegetables and cautions with regard to proper identification, warning of the toxicity of certain species. It does not, however, make a strong enough case against the dangers of overharvesting rare or uncommon species.

In the main text the possibilities of using wild greens as survival food or gourmet fare are explored. Notes on recognition, distribution, habitat and uses (including recipes) are given along with line drawings or photographs of each of the 25 species or groups. Discussed are sea vegetables, lichens, ostrich fern and flowering plants like cattail, cow parsnip, prickly pear cactus and fireweed.

Nearly half of the species or groups described do not occur in Saskatchewan as the authors have chosen plants from a variety of habitats across Canada. Their attention to northern and coastal species is intended to benefit "people living in (these) areas, where domesticated vegetables, if available at all, are difficult to grow and expensive to buy."

A few of the recipes and preparations are cumbersome and involved but they provide most interesting sidelights on traditional use by natives and European explorers.

This book admits to not being an exhaustive list of edible wild greens but it does provide a strong starting point for readers interested in the subject. However, readers should also have access to other reference works, to enable them, for example to gather and prepare the lichens or kelps for safe consumption. As mentioned for earlier volumes in this series, those unfamiliar with wild plants will also need a knowledgeable friend to obtain the best results in identifying and using them. — Reviewed by *Bradley J. Muir,* Waskesiu Lake, Saskatchewan. S0J 2Y0

THE AMPHIBIANS AND REPTILES OF MANITOBA.

WILLIAM B. PRESTON. 1982. Manitoba Museum of Man and Nature, Winnipeg, Manitoba. 128 pp. Illus. Paper $9.95.

Manitoba is richer for the publication late last year of this account of some of its lesser known creatures. A clear writing style, occasionally enhanced with personal anecdotes, makes this slim volume interesting reading for either the experienced novice or professional herpetologist.

The introduction includes an excellent explanation of scientific naming, of what amphibians and reptiles are, and how Manitoba suits them as a place to live. Brief descriptions of historical herpetology and amphibians and reptiles in Indian lore are followed by notes on conversation and techniques for specimen preservation. Keys to tadpoles and amphibian eggs, detailed descriptions and colour photographs of each species plus maps of their Manitoba range round out the book.

Particularly well presented is the explanation of the often confusing system of scientific names. This is supplemented by a careful positioning of each family as it is introduced in the species write-ups. The author takes a firm stand on several questions still debated in the scientific community,

e.g. whether to assign Manitoba's two toads to subspecies or full species; whether any species of earthworms are indigenous to Manitoba (the inference on page 81 is that there are none).

Although this is an account of herpetology in Manitoba, occasionally references are made to studies in other areas and more pertinent Manitoba studies are overlooked. For instance, the description of the diets of Tiger Salamander larvae in Colorado could have been supplemented by the results of a Manitoba study which identified *Gammarus* as an exclusive food item for this species for much of the summer.[1] Similarly, the mention of transformation dates for Canadian Toads in Minnesota is interesting, but the same observations at Delta, Manitoba are more relevant.[3] A second paper by that writer records Manitoba Boreal Chorus Frogs in Manitoba calling in March, slightly earlier than reported in this book.[2]

The author's very careful and concise presentation of a great deal of information occasionally leaves the reader wanting more. For instance, the detailed description of the historic significance of reptiles and amphibians to Indians could have been extended to include their present significance, both to Indians and others, as reflected in the commercial harvest of frogs and snakes. This omission leaves part of the notes about animal collecting laws curiously unexplained. Later in the book the Red-sided Garter Snake, Manitoba's most intensively studied reptile, receives only a brief treatment in the text and literature cited, despite the numerous scientific papers and theses that have been written about it.

The book is attractively presented, in no small measure due to the author's exceptional photographs. These are placed with the species write-ups rather than grouped together — more expensive perhaps, but so much easier to use. One might wish for a bit more open space in the text and criticize the layout artist who sometimes contrives to put the species heading at the bottom of one page with the write-up on the page following, yet these minor design problems detract little from a very handsome and well-bound volume.

Only the map section is disappointing. The usefulness of the maps would be increased if they displayed fewer rivers and lakes in favour of more towns for orientation. An indication of scale would be helpful to an out-of-province person, as would locating on the biome map the sites of the 12 habitat photographs.

The Amphibians and Reptiles of Manitoba is a valuable reference for anyone interested in Canadian herpetology. The author's easy writing style and his outstanding photographs also make it an attractive acquisition for armchair naturalists and a moderately-priced gift for anyone who might enjoy finding out more about these often little-known animals.

[1] OLENICK, ROBERTA J. and JOHN H. GEE. 1981. Tiger salamanders (*Ambystoma tigrinum*) and stocked rainbow trout (*Salmo gairdneri*): potential competitors for food in Manitoba prairie pothole lakes. Canadian Field-Naturalist 95(2):129-132.

[2] TAMSITT, JAMES R. 1961. Notes on the herpetofauna of the Delta Marsh of Lake Manitoba, Canada. Canadian Field-Naturalist 75(3):149-151.

[3] TAMSITT, JAMES R. 1962. Notes on a population of the Manitoba toad (*Bufo hemiophrys*) in the Delta Marsh region of Lake Manitoba, Canada. Ecology 43(1):147-150.

— Reviewed by *Carol A. Scott*, 87 Woodgreen Place, Winnipeg, Manitoba. R3J 1H4.

LETTERS

PIPING PLOVERS

Last week I was in Ottawa at the Canadian Nature Federation and among other things I told them that we found Piping Plovers nesting at Manito Lake and they gave me a report on Piping Plovers, Pelicans and Red-necked Grebes. I showed them this rather good picture of a Piping Plover at her nest which was taken by Mrs. Eileen Graham. — *Hans de Vogel*, Neilburg, Saskatchewan.

Eileen Graham wrote: I am enclosing two other pictures of our Piping Plover. The one of her nest [See page 121 - Ed.] was particularly interesting to me — to think of all the trips she made to gather little stones to line her nest is incredible. It was very exciting to me to see this little bird. — *Eileen Graham*, Box 15, Marsden, Saskatchewan. S0M 1P0

Piping Plover at nest, Manito Lake, Saskatchewan. *Eileen Graham*